VOL. 28 No. 12

BULLETIN

OF THE

TORREY BOTANICAL CLUB

DECEMBER 1901

New Species of Uredineae.—I

BY J. C. ARTHUR

In the examination of material sent by various collectors for identification, and of other material that has been in the author's herbarium for a time, some forms of *Uredineae* have come to light that seem worthy of description as new species. The collections were made at various localities in the United States west of the Mississippi river. The type specimen is in each case preserved in the author's herbarium, but other specimens of the type collection, which may be identified by data attached, especially by time of collection, have been freely distributed as far as material permitted.

Puccinia Batesiana sp. nov.

Spots inconspicuous; fungus hypophyllous; teleutospores arising from the aecidial mycelium; uredospores wanting.

I. Aecidia in small groups; peridia shallow, rather large, border irregular; spores pale, subglobose, 18–26 μ in diameter, evenly and conspicuously verrucose; wall thin.

III. Teleutosori primarily arising close to the aecidia, black, shining, forming dense rounded masses; spores oblong to obovate, usually much attenuated, very little constricted, 15–20 × 45–58 μ, wall thin; apex obtuse or acuminate, more or less thickened, often up to 12 μ; base narrowed; pedicel slender, colored, 10–25 μ long.

On leaves of *Heliopsis scabra* Dunal, Long Pine, Neb., Aug. 4, Aug. 24 and Oct. 3, 1900. *J. M. Bates.* The first collection is taken as the type. Also Ames, Iowa, July, 1887, *A. S. Hitchcock*, communicated by E. W. D. Holway. This is a very distinc-

tive species, easily recognized. No collection of the aecidial form in its prime has yet been made and the description is necessarily based upon aecidial remains accompanying well developed teleutospores. Since the name of the species was suggested by the writer, it has appeared twice in botanical publications: in Shear's *Ellis and Everhart's Fungi Columbiani continued*, No. 1463, accompanying exsiccati, and in *Botanical Survey of Nebraska*, No. 5:23, in both cases as *nomina nuda*. The specific name is bestowed in recognition of the valuable services to uredinology, especially in observations upon the Nebraska rust flora, rendered by the discoverer of the species, Rev. J. M. Bates.

Puccinia epicampus sp. nov.

Sori amphigenous, largely sunken between the veins, oblong or linear.

II. Sori brownish-yellow, soon naked, ruptured epidermis prominent; uredospores oblong or nearly globose, 22–24 x 26–30 μ; wall rather thick, colored, obscurely echinulate or papillose; pores four, equatorial.

III. Sori dark brown, soon naked; teleutospores oblong or elliptical, slightly or not at all constricted, rounded at apex and base, 22–26 x 30–40 μ; wall thick, thicker at apex; pedicel firm, hyaline, tinted at base, once to thrice length of the spore.

On leaves of *Epicampes ringens* Benth., Hot Springs, N. Mex., Sept. 13, 1896. *E. W. D. Holway.*

Puccinia xylorrhizae sp. nov.

O. Spermogonia amphigenous nearly colorless, small, sunken in the substratum.

III. Teleutosori amphigenous, circinating about a small roughened area, nearly black, opening progressively from the center outwardly, soon naked; teleutospores oblong or narrowly oblong, slightly narrowed at both ends, very little constricted at the septum, 21–26 by 43–50 μ, apex subacute or obtuse, much thickened, pedicel thick, firm, somewhat tinted, usually about as long as the spore.

On leaves and stems of *Xylorrhiza glabriuscula*, Laramie Plains, Wyoming, June 27, 1897 (*Aven Nelson*), and Coopers Lake, Wyoming, June 17, 1901 (*Leslie Goodding*, no. 19), the latter being the type.

The sori of this species are deep seated in the tissues of the host, not simply beneath the epidermis, as usually is the case, and the opening at first is a pore, which is gradually enlarged. In each sorus there are generally a few uredospores, which are golden yellow, globose, 24–26 μ in diameter, and minutely verrucose. There are also a few pseudospores, which are colorless, globose, 37–52 μ in diameter, and coarsely verrucose. Before dehiscence of the sorus these are situated between the layer of teleutospores and the roof of the sorus. The nature of the pseudospores is not apparent.

Puccinia vilis sp. nov.

Sori amphigenous, oblong or linear, seated on brown spots, long covered by the epidermis.

II. Sori brown; uredospores elliptical, ovate or globose, 18–26 x 22–30 μ, brownish-yellow; wall thick, 3–4 μ, bluntly echinulate appearing verrucose; pores four, equatorial, conspicuous.

III. Sori dark brown; teleutospores elliptical to obovate, 19–23 x 33–45 μ; wall of medium thickness; apex obtuse, thickened, somewhat deeper color; base rounded or narrowed; pedicel tinted, firm, shorter than the spore.

On leaves of *Panicum Crus-galli* L., Nordness, Iowa, Sept. 17, 1898. *Alois F. Kovarik*, comm. by E. W. D. Holway. Appears to be most closely related to the South American *Puccinia Huberi* Henn., which occurs on *Panicum ovalifolium*.

Puccinia panicullariae sp. nov.

Sori amphigenous, oblong, small, long covered by the epidermis.

II. Uredospores subglobose or oblong, pale yellow, 15–21 x 18–26 μ; wall of medium thickness, minutely echinulate; pores six, scattered.

III. Teleutospores oblong, clavate or almost linear, brown, very little constricted, 15–19 x 43–70 μ, apex rounded or obtuse, occasionally with a few papillae, somewhat deeper tinted but not thickened; base narrowed into the very short, colored pedicel; paraphyses none.

On leaves of *Panicularia Americana* (Torr.) MacM. (*Glyceria grandis* Wats.), Spirit Lake, Iowa, Oct. 20, 1894, Dec. 28, 1896, and Aug. 3, 1898, the last taken as the type. *J. C. Arthur*. An

inconspicuous species, found in only one locality. In the same locality *Aecidium Boltoniae* was found, and nowhere else, and this exclusive association naturally suggests that the two forms are genetically related. The uredo- and teleutospores are formed beneath the epidermis of the mesophyll, and on the upper surface, beneath the bulliform cells.

Aecidium boltoniae sp. nov.

Spots pale yellow; spermogonia amphigenous, waxy orange; spermatia oblong to ovate, 3 x 5 μ; peridia mostly hypophyllous in well-defined groups, shallow, border irregular; spores pale yellow, subglobose, 13–17 μ, inconspicuously verrucose; wall thin.

On leaves of *Boltonia asteroides* (L.) L'Her., Spirit Lake, Iowa, June 15 and 22, 1900, and June 18, 1901. *J. C. Arthur.* Host growing in wet ground in the midst of *Panicularia Americana.*

Aecidium magnatum sp. nov.

Spots pale, circular; peridia hypophyllous, cylindrical, sometimes elongated, border jagged; spores yellow, subglobose, large, 26–37 μ, prominently, closely and uniformly verrucose.

On leaves of *Vagnera stellata* (L.) Morong (*Smilacina stellata* Desf.). Valley of the Teton, northern Montana, July, 1889. *F. W. Anderson.* This is readily distinguished by the size and roughness of the spores from the aecidium on the same host belonging to *Puccinia majanthae* (Schum.) A. & H.

Aecidium anograe sp. nov.

Spots reddened, somewhat thickened and bullate; peridia densely clustered, mostly hypophyllous, elongated, cylindrical, border torn into narrow fringe, at length somewhat revolute; spores yellow, 22–26 μ, subglobose, evenly verrucose; wall thick, 3 μ.

On leaves of *Anogra pallida* (Lindl.) Britt. Type collection from Long Pine, Neb., May 23, 1900, No. 1325. Subsequent collection from Merriman, Neb., June 6, 1900. Both by *J. M. Bates.* Spores much larger and rougher than in *Aecidium Peckii* De T.

Peridermium ornamentale sp. nov.

Peridia in two rows along the under surface of the leaves, cylindrical, 1–2 μ long, at first bright orange, margin entire or erose; spores obovate, elliptical or nearly globose, 13–17 x 20–26 μ; wall thin, closely and finely verrucose.

On *Abies lasiocarpa* Nutt., Mount Paddo, Wash., at about 6000 ft. alt., Sept. 4, 1900. *W. N. Suksdorf*, comm. by E. W. D. Holway.

Gymnosporangium Nelsoni sp. nov.

Sporiferous masses globose, pulvinate cinnamon-brown, 1–2 μ in diameter, solitary, or occasionally aggregated to form swellings; spores angular-oval or elliptical, not constricted at the septum, 22–26 by 41–52 μ, obtuse, usually narrowed toward each end; wall uniformly thin; pedicels hyaline, slender, firm, once to thrice the length of the spore; mycelium annual.

On the leaves or leafy branches of *Juniperus scopulorum* Sargent, Laramie Hills, Wyoming, May 10, 1895, No. 1886. *Aven Nelson.* The type collection has been rather widely distributed as *G. clavipes*, a species which it resembles, but from which it is readily distinguished by the slender pedicels and general habit.

Roestelia Nelsoni sp. nov.

Spermogonia epiphyllous, in clusters on yellow spots, prominent, nearly black, very numerous.

Aecidia hypophyllous in groups; peridia long, 2–4 mm., linear, somewhat curved, dehiscent by longitudinal slits toward the base, apex subacute, remaining closed; spores globose, 24–30 μ in diameter, wall rather thick, chestnut-brown, minutely verrucose or smooth, pores about eight, without order, prominent.

On leaves of *Amelanchier alnifolia* Nutt., Laramie Hills, Wyoming, August 5, 1901. *A. Nelson*, no. 8597, communicated by F. S. Earle.

An interesting species, and especially so as it appears to be the aecidial form of *Gymnosporangium Nelsoni*, described above. In a letter Professor Nelson says: "This was collected in the exact spot where the *Gymnosporangium* was secured. There can be little doubt of the interrelation of the *Roestelia* and *Gymnosporangium*." I have given the same specific names to both forms, hoping that cultures in the near future will establish their identity.

Roestelia fimbriata sp. nov.

Spermogonia epiphyllous, in clusters on orange spots, prominent, nearly black.

Aecidia hypophyllous, in groups on a thickened substratum; peridia dehiscent into long fibers forming a somewhat curled fringe; spores subglobose, 32–45 μ in diameter, wall of medium thickness, chestnut-brown, verrucose.

On leaves of some species of *Sorbus*, Elk mountains, Wyoming, August 21, 1901, *Leslie Goodding*, no. 554.

Notes on Californian Species of Delphinium

By Alice Eastwood

I. DELPHINIUM DECORUM F. & M. AND ITS ALLIES

The Californian species of *Delphinium*, like those of many other Californian genera, are but little understood. This is owing to the remarkable tendency to variation, to the confusion in regard to the types, and to the generally inadequate material in herbaria.

Delphinium decorum F. & M. is one of the most puzzling species, under which plants quite different in appearance have been included. The species was originally described by Fischer and Meyer (Ind. Sem. Petr. **3**: 33. 1836), and the description was transcribed into the supplement of Linnaea (Linnaea **12**: Suppl. 92). As seen in this description, given in the footnote, the type locality is Bodega Port.*

To rediscover this and some other plants described from the same place, the writer visited this port twice in the spring and summer of 1899. Only one species of *Delphinium* was found around the port. This grew on the ocean side of the promontory which rises about a hundred feet from the sea. The native vegetation of the promontory has been preserved from destruction by a fence which has been built around it to keep the cattle from the danger of being carried down to the surf below on some of the land slides which frequently occur during the wet season. From the specimens collected there the following description has been made:

---

* *Delphinium* (*Delphinastrum*; *Coh. grumosa*: Petalorum lamina dilatata, bifida: petioli basi vix dilatati: radix tuberosa-grumosa. Huc *D. Menziesii*, *D. elegans*, *D. tricorne*) *decorum Fisch. et Mey.* D. pubescens, subglabrum: foliis tripartitis: segmentis lateralibus bifidis indivisve: lobis oblongis tridentatis I. integerrimis: floralibus bracteisque suboblongis (plerumque) integris: calcare curvulo sepalorum longitudine. —*D. Menziesii* et *D. eleganti* proximum, sed foliis bene distinctum. Flores, speciosi, primo ex coeruleo violascentes, dein violaceo-purpurascentes.—Hab. circa coloniam Ruthenorum Ross in portu Bodega Novae Californiae.

DELPHINIUM DECORUM F. & M.

Roots fibrous from a single roundish or irregularly lobed tuber, about 1 cm. below the true stem. Stems one to several from the root, 1–2 dm. high, diffusely branched from the base or simple, striate, somewhat glabrous or pubescent with short white deflexed curly hairs. Radical leaves on petioles 3–12 cm. long, broadening at base and sheathing the stem: blades with from 3–5 main divisions, these cuneate, separated, 1–3 cm. long, 5–15 mm. broad, 2–3-lobed with rounded, mucronate lobes: pubescence of lower surface similar to that of the stem, upper surface almost glabrous: cauline leaves, if present, with narrower divisions, generally simple and entire. Inflorescence corymbose: lowest bracts with usually simple, entire, oblong divisions on short petioles: upper bracts and bractlets spatulate, entire, 5–10 cm. long, 2–8 mm. broad: pedicels stout, erect or upwardly spreading, often becoming 6 cm. long, with 2 or 3 alternate or, rarely 2 opposite bractlets. Flowers 25 mm. in diameter, purplish blue. Sepals pubescent externally, especially along the median line, with a greenish spot near the top, oblong or oval, obtuse or acute, 10–15 mm. long, 5–10 mm. wide: spur thick, 10 mm. long, straight or curved on the same plant. Lower petals with orbicular, 2-lobed blade and a claw equally long, spurred at base, covered with long white hairs except on a spot above the claw which is clothed with long yellow hairs: upper petals white, tinged or veined with blue, notched at apex, glabrous. Follicles diverging from the first, glabrous or slightly pubescent when ripe, 15 mm. long, including the persistent styles. Seeds brown when ripe, the loose cellular outer coat of the young seed forming a close, tuberculate covering to the ripe seed.

Specimens are represented in the Herbarium of the Academy by no. 801 from Cobum's Mills, collected by T. S. Brandegee, May 29, 1891, and by a specimen collected by the author at Kaweah, Tulare county, May, 1894, no. 789. With this is another specimen similar in all respects except the pubescence, it being glabrous where the other is glandular-hairy. This leads me to think that the character of the pubescence is not to be relied on as a characteristic and that all of these are but forms of the same species modified by environment which cultivation under similar conditions might prove to be identical. If this glandular form should not prove to be a distinct species, it nevertheless deserves varietal rank.

The type descriptions are appended in the footnotes for the benefit of those to whom the original references are not accessible.

II. NEW SPECIES OF DELPHINIUM

Delphinium polycladon sp. nov.

Stems 8 dm. tall with many spreading, slender, rather weak branches. Lower part of plant glabrous, pubescence scanty on the leaves, denser on the upper stems and pedicels, close on the follicles. Leaves mostly near the base, orbicular in outline, 6 cm. across, with 3–5 broad, cuneate divisions having short, acuminate lobes: petioles long and slender, often more than 10 cm., dilated at the clasping base. Inflorescence paniculate, pedicels erect, 2–4 cm. long, bracts narrowly subulate, bractlets filiform near the flower. Flowers small, about 2 cm. across, bluish purple. Sepals obovate, obtuse, spur 8 mm. long, usually curved at tip. Upper petals white veined with blue, lower petals oblong, deeply emarginate, with a prominent spur on the claw and a yellowish, very hairy spot at the base of the blade. Follicles with thin walls through which the outlines of the large seeds are plainly visible, becoming almost moniliform when the seeds are ripe, spreading but little. Ripe seeds brown, angled, rugose, almost 2 mm. in diameter.

This interesting *Delphinium* was collected by the writer near the forks of Bubbs Creek in Fresno county, California. It grew in a thicket where the ground was springy. It was impossible with the tools at my command and the time at my disposal to dig up the roots. It was collected July 9, 1899.

Delphinium pratense sp. nov.

Root grumous, small and near the surface. Stems slender, simple or branched from the base, about 3 dm. high. Pubescence villous with soft, white, deflexed-spreading hairs, usually densest on the lower stem and inflorescence. Radical and lower cauline leaves about 3 cm. broad, with 3–4 cuneate divisions each with linear-oblong mucronate lobes: petioles 3–6 cm. long, broadening at base and sheathing the stem: cauline leaves, except the lowest, really bracts subtending the lowest pedicels, with simple, linear, entire divisions or lobed. Flowers at first scattered on long pedicels, later forming a loosely or closely flowered raceme which is simple or compound: lower pedicels 5 cm. long, upper 1.5 cm.: upper bracts becoming simple and linear, about half as long as the pedicels: bractlets opposite or alternate, on the upper part of the pedicel, narrowly linear. Flowers purple and white, small, 15 mm. across, the spur straight, horizontal, 1 cm. long, very

slender, often bidentate at tip. Lower sepals almost equalling the spur, obovate, acute, the upper broader and with a conspicuous saccate spot near the apex. Lower petals bifid and erose, pubescent, white with a purple blotch near the base of the blade, with the broad claw shorter than the blade and with a spur at base: upper petals triangular-ovate, 2-lobed at apex, white, margin undulate. Follicles pubescent, slightly spreading. Seeds with a close, brown, minutely rugose coat, with a membranous crown at summit.

This grows in the high meadows of the Sierra Nevada. The specimens were collected in Horse Corral Meadow on the trail to the Kings River Cañon, July 9, 1899 (by the writer).

Delphinium subnudum sp. nov.

Roots of fleshy, fascicled tubers, near the surface. Stems simple, erect, slender, 2–3 dm. high, pubescent with fine, white, soft, spreading, deflexed hairs. Radical leaves broadly ovate in outline, 2–5 cm. broad at base and of equal length: main divisions 3, each twice dissected, the ultimate divisions linear-spatulate, mucronate: petioles broad and sheathing at base, ribbed: cauline leaves 2 or 3, very small and inconspicuous, the palmately divided blade in most only as broad as the sheathing base of the petiole. Raceme few-flowered: bractlets generally opposite and close under the flower: pedicels slender, erect or somewhat tortuous. Flowers rather large, purplish blue. Sepals somewhat pubescent externally, oval, generally mucronate, 18 mm. long, 12 mm. broad, upper one orbicular, 14 mm. broad: spur straight or recurved at tip, as long as the calyx. Upper petals entire, crenate, or notched, white or bluish: lower petals with orbicular, notched blade, claw with a conspicuous spur near the base. Follicles pubescent, somewhat spreading: style tipped with 2-toothed stigmas. Seeds covered with a loose, white membranous, veiny coat.

This was collected by the writer in Squaw Valley, Fresno county, California, May 4, 1895. It grew in a low spot where water had stood and was distributed over a limited area. I have also included in this species a specimen from Applegate, Placer county, California, collected by Mrs. Helen Smith, May, 1899.

In the specimen from Fresno county the spur is almost straight, in the Placer county specimen the spur is abruptly bent at the tip. This does not seem to be a character of any importance, for in other species the spur is often both straight and curved in the same plant. The follicles and seeds were described

from the Placer county plant, that from Fresno county being too young. A search over the entire area covered by the plants failed to discover a single fruiting specimen.

Besides the specimens collected at Bodega Port (no. 770),* there is another typical specimen in the Herbarium of the California Academy of Sciences. This is one collected by Dr. Kellogg, at San Gregorio, in San Mateo county, May 14, 1870 (no. 771).

DELPHINIUM DECORUM **racemosum** var. nov.

This is the form common in the vicinity of San Francisco. It is distinguished by racemose inflorescence, simpler, more glabrose, taller stems, narrower bracts and bractlets, the latter generally opposite and close under the flower, spurs generally straight. The flowers vary somewhat in size and generally are smaller than those of the typical form. This is probably the *D. Menziesii* of the Manual of the Bay Region: *D. decorum* of that work being more like *D. patens* Benth. (Pl. Hartweg. 296). Specimens of this variety are represented in the Herbarium of the Academy from Sausalito (no. 765), and Mt. Tamalpias (no. 766), in Marin county, from Colma (no. 767) and Crystal Springs (no. 763), San Mateo county, and from Mission Hills, Stanford Heights (no. 769), and Bay View Hills (no. 762), San Francisco.

DELPHINIUM DECORUM **Sonomensis** var. nov.

Similar in habit to the preceding variety, but with denser pubescence, more evidently canescent; leaves with narrower, more dissected divisions; flowers with narrower sepals and stouter spurs. This form was collected by the writer at Altruria, Sonoma county, April 7, 1900. (No. 764.)

There are some other specimens in the herbarium of the Academy, which appear to belong under *D. decorum* but the material is too imperfect, as the roots and fruits are wanting, and it is better to leave them unnamed and undescribed than to add to the already existing confusion.

At present the small-flowered species of *Delphinium* which has been named *D. decorum* F. & M. in the "Manual of the

* These numbers are the herbarium numbers of the specimens.

Botany of the Region of San Francisco Bay," seems to be without a name. Professor Greene suggests, in a letter recently received, that it is what he named *D. apiculatum*, Pittonia, I. 285. This can scarcely be the case for the character of the root is quite different. According to his description, the root is similar to that of *D. recurvatum* which he describes on the same page as having a fascicle of fleshy-fibrous thick roots. *D. apiculatum* must be, as he himself there suggests, a near relative of *D. variegatum* T. & G. of which he subsequently made it a variety. (Fl. Francis. 304.)

D. decorum is more like *D. patens* Benth. (Pl. Hartweg, 296.) It is not clear to the writer what difference there is between *D. patens* and *D. gracilentum* Greene. (Pittonia, **3**: 15.)* Until the types are better known and the differences between these species clearly defined it seems best to consider these two species as the same, under the oldest name, recognizing the fact that they do not exactly agree with the original description of *D. patens* which is given in the footnote† nor, in all particulars, with each other.

Specimens have been examined from the following localities represented by specimens in the Herbarium of the California Academy of Sciences:

Santa Inez Mountains, T. S. Brandegee (no. 915).

El Dorado, Katherine Curran (no. 914).

---

* DELPHINIUM GRACILENTUM. Slender, usually 2 feet high or more, from a grumous-tuberiform root, sparsely leafy, pale green and glaucescent, appearing glabrous, a lens revealing short stiff white hairs at the base of the stem, and again upon the small bracts of the inflorescence: radical leaves few, long-peduncled, 2 or 3 inches broad, deeply about 5-parted, the lobes mostly oval or oblong, obtuse and entire; lower cauline more cuneately cleft, and the segments 3-lobed: racemes long, slender and lax: flowers small, deep blue (pink in the frequent albino state), the stoutish slightly curved spur little exceeding the oblong sepals: follicles slightly divergent

Middle elevations of the Sierra Nevada, California. It is the *D. patens* of my Flora Franciscana, and I formerly supposed it to be the plant which Bentham so named; but having seen the specimens on which *D. patens* was founded, I am certain that that is only *D. decorum*: not even a variety of that species. In the "*D. patens*" of my Flora I included a plant which is of a "deeper green, and glandular pubescent." This, I think, will prove to be another distinct species of the Sierra Nevada, though I am not yet able to assign characters enough to warrant its publication. Its root is still unknown to me. Pittonia, **3**: 15. Greene.

† "Delphinium *patens*, sp. n., glabrum v. puberulum, ramosum, petiolis basi dilatatis, foliis profunde 3–5 lobis, lobis inferiorum obovatis obtusis subtrilobis superiorum subintegris angustis, racemis laxis, petalis sepalis brevioribus, inferioribus bifidis barbatis, ungue glabriuscula ecalcarato, calcare curvulo sepalis aequilongo.—Flores iis D. azurei similes sed racemi laxi pedicellis patentibus, et folia multo minus dissecta, lobis latis obtusis.—In valle Sacramento." Pl. Hartweg. 296[2]. Benth.

Cucumongo Mountains, S. B. Parish, no 1718 (no. 912).

Los Gatos, T. S. Brandegee (no. 911).

Mokelumne Hill, Dr. F. E. Blaisdell (no. 909).

Calistoga, Alice Eastwood (no. 907).

Antioch, Katherine Curran (no. 906).

Saucelito, Alice Eastwood (no. 905).

Monterey, Alice Eastwood (no. 908).

Armstrong's Station, Eldorado county, Geo. Hansen, no. 1114 (no. 792).

Stony Creek, Amador county, Geo. Hansen, no. 1606 (no. 913).

Soda Creek, Tulare county, C. A. Purpus, 1848 (no. 791) and (no. 790).

Silver Lake, Amador county, Geo. Hansen, no. 897 (no.788).

Volcano, Amador county, T. S. Brandegee (no. 786.)

Forest Ranch, Butte county, Mrs. C. C. Bruce, 1914 (no. 787).

Modoc county, Mrs. R. M. Austin (no. 916).

These can be characterized as follows: Roots grumous, pubescence little or none, leaves mostly from the base of the stem on rather long petioles, with broad, cuneate, lobed divisions, generally spreading apart: loose open racemes with small flowers on slender, upwardly spreading pedicels: follicles generally glabrous, widely spreading. In Bentham's description, the claw of the lower petal is said to be "glabriuscula ecalcarato." This is the case with the following specimens only, the numbers used to designate them being the herbarium numbers which are in parenthesis. 790, 791, 908, 906 (this is most like the type according to the description), 907, 909 (spur slightly evident), 911, 912 (spur scarcely evident).

The glandular species of the southern Sierra Nevada which Professor Greene alludes to in his description of *D. gracilentum* seems to me also as deserving of specific rank. It is very closely allied to those specimens included under *D. decorum* in the above general description, but differs in some marked particulars. It is as well to name and describe it, as to point out its characters without a formal description, therefore I name it for him who first detected its specific character.

Delphinium Greenei sp. nov.

Many slender fibers from a grumous root, a short distance below the surface of the ground. Stems 3–5 dm. high, generally reddish and glandular pubescent above, inclined to be glabrous below, generally simple. Leaves similar to those of *D. decorum*, the divisions always mucronate at the rounded apex and the sinus between the broad divisions obtuse. Racemes less open, the pedicels shorter and the flowers smaller, frequently dull rose color rather than violet blue. The inflorescence is more distichous and is glandular-hairy on peduncles and pedicels. Sepals surpassing the petals, shorter than the spur, this curved upwards in the bud, generally straight on the open flower, lower petals with blade lobed almost to the base, clothed with long hairs and having a rather broad claw as long as the blade and distinctly spurred near the base; upper petals also lobed, undulate along the upper margin. The immature follicles are glandular-hairy and spreading.

Germination of the Seeds of some common cultivated Plants after prolonged Immersion in Liquid Air *

By A. D. Selby

During the winter season of 1900–1901, Mr. J. E. Woodland, of Wooster, who was traveling at the time conducting experiments with liquid air, suggested to the writer the desirability of subjecting seeds to the low temperatures resulting from immersion in the liquid air, and very kindly offered to conduct the immersion if the seeds and the directions for the work were supplied. This generous offer on the part of Mr. Woodland entailed no small labor as he was traveling from place to place and his time was absorbed in his lecture work. It is needless to state that the offer of coöperation was accepted. Packages of seeds of *Ricinus*, *Lupinus luteus*, maize, flax, wheat, rye, cucumber, *Mimosa pudica*, *Onobrychis sativa*, *Pinus sylvestris*, *Cotoneaster buxifolia*, and *Chenopodium album*, consisting of a limited number of seeds of each species, were tied separately in open Swiss cloth and these were collectively for each set united in small bundles. Properly enclosed these were transmitted by mail and returned after immersion in the medium, liquid air. The seeds were then germinated upon moistened filter paper together with untreated seeds out of most of the original packages from which the immersed seeds were taken. By an oversight or by neglect to reserve them, the seeds of maize, *Ricinus*, *Lupinus luteus* and *Chenopodium album* are not recorded in the check lots. The germination of the untreated seeds of the latter is thought to have been good. The seeds of *Cotoneaster* did not prove germinable.

Similar lots of the seeds were also planted in the greenhouse in flats, and while the germinations were decidedly irregular in the soil, they may possess interest. Those who have endeavored to grow many sorts of seeds in soil under glass in the mid-winter season, may be less surprised than others at this feature. The

* Presented in abstract before Section G, American Association for the Advancement of Science, Denver Meeting, August, 1901.

lots of seeds consisted of 10 to 25 seeds of each species for germination in soil and tester.

The manner of immersion was by sudden approach of the seeds from room temperature to that of immediate, complete and prolonged immersion beneath the liquid air, the seeds the while being contained in the gauzy cotton, which we may designate "sudden transition," or by gradual approach of the seeds into nearness with the liquid air followed by the complete immersion therein and similar gradual withdrawal, "gradual transition."

Summarized, the treatment of the several lots was as follows:

By sudden transition:

One lot 6 hours' immersion under liquid air.

One lot 12 hours' immersion under liquid air.

By gradual transition:

One lot 24 hours' immersion under liquid air.

One lot 48 hours' immersion under liquid air.

Save the seeds of maize, no apparent change occurred as a result of the low temperature to which they were subjected. The kernels of maize cracked badly, showing that the hardened endosperm could not withstand the stress imposed. It was curious to observe these germinate with fragments of the endosperm missing.

TABLE I

GERMINATION PERCENTAGES OF TREATED AND UNTREATED SEEDS ON FILTER PAPER

NAME OF SEED	Untreated				Immersed in Liquid Air by sudden Transition								Immersed in Liquid Air by gradual Transition							
	Orig. Seeds				6 hours				12 hours				24 hours				48 hours			
	4 days.	8 days.	15 days.	28 days.	4 days.	8 days.	12 days.	23 days.	4 days.	9 days.	16 days.	21 days.	3 days.	6 days.	8 days.	11 days.	3 days	6 days.	8 days.	11 days.
Onobrychis sativa.		8	12	12							4	16			4	4		4	4	4
Mimosa pudiva.		14	34	40		10	34	38			24	48		16	16	16		16	24	24
Pinus sylvestris.			16	18			4	12			20	28				4			4	16
Helianthus annuus.	75	85	85	85	25	90	90	90	80	86	86	86		90	100	100		90	100	100
Cucumis sativus.	28	60	80	80		60	66	66	53	73	73	80		100	100	100		60	70	70
Secale cereale.	90	90	90	90	100	100	100	100	96	96	96	96	100	100	100	100	100	100	100	100
Triticum sativum.	92	92	92	92	96	96	96	96	92	92	92	92	12	96	96	96	12	96	96	96
Linum usitatissimum.	84	86	86	86	80	82	82	82	76	84	84	84	40	72	72	72	36	84	84	84
Zea Mays.	Not tested.				Not tested.					50	50	50		30	30	30		20	20	20
Ricinus communis.	"	"			"	"				60	60	60		50	70	70		30	30	30
Lupinus luteus.	"	"			"	"						0			10	10				0
Chenopodium album.	"	"			"	"				12	76	80		12	92	96		4	68	76

TABLE II

GERMINATION PERCENTAGES OF TREATED AND UNTREATED SEEDS IN SOIL

NAME OF SEED	Untreated				Immersed in Liquid Air by sudden Transition								Immersed in Liquid Air by gradual Transition							
	Orig. Seeds				6 hours				12 hours				24 hours				48 hours			
	4 days.	9 days.	13 days.	25 days.	4 days.	6 days.	14 days.	29 days.	4 days.	7 days.	14 days.	30 days.	4 days.	6 days.	10 days.	30 days.	4 days.	6 days.	10 days.	30 days.
Onobrychis sativa				0				4				4			7	7				0
Mimosa pudica				20				0				24				16				16
Pinus sylvestris				7				0				0				0				0
Helianthus annuus		66	80	80		40	60	60		42	42	50		60	60	60	20	40	40	40
Cucumis sativus				0				0				0	7	7	7	7				0
Secale cereale	20	53	53	53	32	76	76	76	16	56	60	60	72	80	80	80	80	84	84	84
Triticum sativum	20	86	86	86	36	68	88	88	16	92	92	92	72	76	76	76	60	76	80	80
Linum usitatissimum		47	47	47		8	12	12	8	24	36	36	12	44	44	44	36	44	48	48
Zea Mays				0	Not tested.							0				0				0
Ricinus communis				47	"	"						50				0			33	33
Lupinus luteus				0	"	"						0				0				0
Chenopodium album				36	"	"					8	40			13	27			16	32

Somewhat of irregularity in the length of the day periods is due to the fact that these lots were handled at different times and equal intervals were not followed.

It is not apparent to the writer that any marked unfavorable effect on germinable seeds may be traced to the immersion, that is, to the extremely low temperature to which they were subjected. Gradations appear with respect to the results of a longer or shorter operation of the cold, perhaps, more conspicuously on seeds of lower vitality. With sunflower, wheat, rye, even the prolonged period of 48 hours has increased if it has in any manner changed the promptness of germination, comparing the more regular germination upon moistened filter paper.*

The temperature of liquid air is stated at — 190° C. Certainly the seeds immersed in liquid air for 48 or even 24 hours would scarcely fail to come to the temperature of the surrounding medium. Physiologists will doubtless agree that only dry seeds may withstand this low temperature. For the agriculturist the experiments of this class enforce a homely injunction to prepare in advance of the winter.

* MacDougal, Practical Text-book of Plant Physiology, 89–91. 1901.

The papers upon this subject by Brown and Escombe, and Thisleton-Dyer did not come to my attention until after my work was finished. Since I find a substantial agreement in the results of the three separate series of experiments no further discussion seems necessary.

The writer would acknowledge his obligation to his assistant at the Station, Mr. John F. Hicks, who has conducted the germination tests.

SUPPLEMENTAL NOTE

Upon going over considerable of the literature relating to the effect of cold upon seeds and particularly upon their germination, one is impressed by the discovery in every case of the survival of the germinative power after subjection to the lowest temperature obtainable at the time of the experiment.

M. Edwards and M. Colin (1834) subjected seeds of wheat, barley, rye and broad bean to a temperature which froze mercury, permitting the seeds to remain for fifteen minutes after which their power of germination was unchanged. Wartman (1860) made his experiments upon seeds of *Linaria bipartita*, *Clarkia elegans*, *Nemophila insignis*, *Lepidium sativum*, *Triticum sativum*, *Hordeum vulgare*, *Avena sativa*, *Portulaca oleracea* and *Eschscholtzia Californica*, subjecting one lot to a temperature of — 57° C. for thirty minutes and another to — 110° C. for twenty minutes after which germination was unimpaired.

Wartman concludes "Il est donc certain que la grand froid que l'homme sache produire ne detruit point la vitalité des graines, et ne l'amoindrit pas le meme," a conclusion which seems to apply without change to the later experiments of de Candolle and Pictet when the liquefaction of gases became more easily attained as well as to the briefly announced results of Dewar and McKendrick (1892), to the extended series of seeds experimented upon by Brown and Escombe (1897) and to the more rigorous conditions but fewer seeds under experiment by Thisleton-Dyer.

The experiments of Brown and Escombe were upon twelve sorts of seeds by subjecting them for 110 hours to the temperature secured by immersion in liquid air which they state as 183 degrees C. to 192 degrees C. The seeds represent a wide range of families and a wide difference in composition.

To the writer the consonance of the results of a long series of experiments by different persons, by subjecting seeds to extremely low temperatures, appeals with its cumulative force. The facts lend a new significance to the latent life of seeds.

PARTIAL BIBLIOGRAPHY

1834. **Edwards, M. & Colin, M.** De l'influence de la temperature sur la germination. Ann. Sci. Nat. II. **1**: 257–270.

1860. **Wartman, E.** Note relative a l'influence de froids excessifs sur la graines. Arch. Sci. Phys. et Nat. **8**: 227.

1865. **De Candolle, A.** De la germination sous les degrés divers de temperature constante. Arch. Sci. Phys. et Nat. **24**: 243–282.

1879. **De Candolle, C. & Pictet, R.** Recherches concernant l'action des basses temperatures sur la faculté germinative des graines. Arch. Sci. Phys. et Nat. **2**: 354, 629.

1892. **Dewar & McKendrick.** On Liquid Air. Proc. Roy. Inst. **12**: 699.

1897. **Brown, H. T. & Escombe, F.** Note on the Influence of very low Temperatures on the germinative Power of Seeds. Proc. Roy. Soc. **62**: 160–165.

1899. **Thiselton-Dyer, W.** On the Influence of the Temperature of Liquid Hydrogen on the germinative Power of Seeds. Proc. Roy. Soc. **65**: 361; Ann. of Bot. **13**: 699.

OHIO AGRICULTURAL EXPERIMENT STATION,
WOOSTER, OHIO.

Dates of Elliott's Sketch

By John Hendley Barnhart

In 1816 Stephen Elliott began the publication of "A Sketch of the Botany of South Carolina and Georgia," now recognized as a classic among works relating to North American botany. It appeared in parts, the title-pages of the two volumes bearing only the dates of their completion, 1821 and 1824 respectively. In deciding questions of priority, it is highly important to know the exact date of publication of every botanical work in which new names are used, and, it is my intention in this contribution to collate the known facts and the probabilities relating to the actual dates of the different portions of Elliott's Sketch.

Many references to this subject are to be found in recent literature, but without exception these seem to be based upon two brief notices by Asa Gray, which appeared in January and May, 1877, in the American Journal of Science and Arts, of which Gray was at that time the botanical editor. As the first of these contains several inaccuracies, and the second, if carefully compared with the first, corrects some of these; and as the second note has evidently been overlooked by some persons who have noticed the first, it may be well here to reprint them both in full.

The first note (Am. Journ. Sci. III. **13**: 81. Ja. 1877) is as follows:

"*Date of Publication of Elliott's Botany of South Carolina and Georgia.*—The title-page of the first volume bears the date of 1821. But it is well known that the work was issued in parts, and that the publication began much earlier. The actual time of issue becomes important in respect to the priority of certain generic and specific names, notably those in Nuttall's *Genera*, published in 1818. Contrary to the testimony of the title-pages, it is generally understood that Elliott's names of *Podostigma* and *Acerates* have priority over Nuttall's *Stylandra* and *Anantherix*. To avoid future trouble it is desirable to put upon record such evidence upon the point as is now obtainable. The only printed testimony yet met with is in the *Reliquiae Baldwinianae*, the correspondence of Dr. Wm. Baldwin (Elliott's ablest collaborator), lovingly edited

by his friend, Dr. Darlington. By reference to pp. 202, 248, 249, and 585, it is made out that the first number of Elliott's work was issued as early as October, 1816, was recalled, reprinted, and issued anew, along with the second number, before January, 1817. The first number probably ended on p. 96; the second on p. 222. The third and fourth numbers were published before November 10, 1817. The fourth number must have included p. 466: the fifth and concluding number of the volume (to which the title-page assigns the date of 1821) must begin on or before p. 529. For, on the latter page Nuttall's genus *Diamorpha* occurs, and his work is for the first time cited, while the prefatory list of decandrous genera, on p. 466, does not contain *Diamorpha*.

"This is confirmed by Elliott's correspondence with Zaccheus Collins, now in the possession of the Academy of Natural Sciences, Philadelphia, which Mr. Redfield has kindly consulted at my request; from which it appears, in short, that No. 1 was first issued, September 26, 1816; No. 2, on or before February 19, 1817; No. 3, on or before April 3, 1817; No. 4 and No. 5, no data found; No. 6, the commencement of the second volume, appeared on or before October 12, 1821. The title-page of this volume bears the date of 1824."

The unfortunate assumption, reiterated in the foregoing note that No. 5 completed the first volume and No. 6 commenced the second one, vitiates much of Gray's argument. The error is corrected, but no particular attention is called to its importance as affecting the main line of argument in the further note (Am. Journ. Sci. III. **13**: 392. My. 1877):

"*Date of the Parts of Elliott's Botany.*—Referring to our note in the January No. of this Journal, it is worth recording that the first fasciculus actually ended, as was supposed, on p. 96. No. 5 consisted of pages 401–496, and bears the date of 1817. No. 6 contained pages 497–606, and is dated 1821. This information is obtained from the inspection of copies of those parts in their original state, and is obligingly supplied by Mr. F. B. Dexter, of the Yale College Library."

It will be seen that the most accurate evidence given in these two notes relates to No. 1. It consisted of pp. 1–96, was originally issued Sept. 26, 1816, was recalled, reprinted and reissued with No. 2, but Gray makes no reference to the cause of this reprinting. In an "advertisement," published, I believe, with No. 4, Elliott states a reason for this procedure. He says: "THE first and nearly half of the second Number of this sketch had been

printed before I could obtain a copy of Pursh's *Flora Americae Septentrionalis*. This work, published in London under the most favorable auspices, has enabled me to add to my own researches, and those of the friends who have aided me, all that has been collected in this country by the travellers and botanists of Europe. Willing to avail myself of the advantages it afforded me, and to present to my readers as comprehensive a view of our Botany as possible; desirous also not to add to the confusion of synonymes, which is becoming a serious evil in American botany, and to correct a few inaccuracies which had been pointed out to me, I immediately reprinted the first number of my work. In the second number, the alterations were too unimportant to render this measure necessary."

One cause which doubtless strongly influenced Elliott to reprint his first number, but is referred to merely incidentally in the foregoing paragraph, is brought out strongly in certain manuscript evidence to which I have had access. Darlington, in the Reliquiae Baldwinianae, did not publish all of Baldwin's letters which have been preserved. Baldwin was evidently in the habit of writing his letters serially in a note-book, and then copying each from the book, and a number of these note-books (including, it would appear, a portion of those published in Reliquiae Baldwinianae) afterward came into the possession of John Torrey, and are now at the New York Botanical Garden, where I have had the privilege of consulting them, through the kindness of the librarian, Miss Vail.

Among these books is one containing all of Baldwin's letters to Elliott, from August 31, 1815, until his death; and of course this correspondence teems with references to the "Sketch," in which Baldwin was almost as much interested as Elliott himself. Under date of October 7, 1816, he writes, from Savannah: "I have looked over your number one, and am completely satisfied that it is by far the best effort that has been made to redeem the Botanical honor of our Country." With this introduction, he proceeds to criticise the work rather harshly, complaining especially that Elliott has credited to him certain names which he never was responsible for, and imperfect descriptions which he did not intend for publication, and which he wished, after perfecting them, to

publish himself. Undoubtedly these complaints had their influence in inducing Elliott to recall and reprint his first number. On November 11, 1816, Baldwin writes: "I had this day the pleasure to receive your valuable letter of the 8th. No measure could possibly be adopted more to my satisfaction than that of re-printing your first number. Every thing can now be adjusted to our mutual satisfaction."

Elliott seems to have been remarkably successful in recalling and destroying the original edition of the first number of his "Sketch." No copy is now known to exist, and if any should be discovered it would be of the utmost importance that fac-similes of it should be prepared and distributed, for there is no question whatever that it was properly published in every sense of the word, and if its contents were known it would necessitate the alteration of several names of southern species.

I have often wondered to what extent the first edition differed from the second, which forms pages 1–96 of all known copies, but had never found a line bearing upon the subject until I discovered these letters of Baldwin to Elliott. Baldwin's letters of October 7th and 13th, and November 11th, mention specifically certain features of the original edition which were altered in the reprint, and it seems worth while to place these on record, although I would not advocate taking up the older names as long as no copy of the original edition is known to exist, and we are unable to cite the page with certainty. In the following list, the citations are from the known edition, the differences in the first edition being noted.

P. 36. *Collinsonia verticillata* Baldw. This was not in edition 1; it was first described in Baldwin's letter of November 11.

P. 39. *Erianthus strictus* Baldw. This was described by Baldwin in his letter of November 11, but it is not clear whether the species was not mentioned in the original edition, or Baldwin was dissatisfied with the description as it there appeared.

P. 53. *Xyris juncea* Baldw. This appeared as "*Xyris setifolia* Baldw." originally, but Baldwin indignantly disclaimed responsibility for this name, so Elliott changed it.

P. 90. *Dichromena latifolia* Baldw. This was *Dichromena involucrata* in the first place, but in his letter of October 13, Bald-

win called Elliott's attention to the fact that he had named it *D. latifolia* in previous letters, so this name was adopted in the new issue.

So much for the first number. The date of the second number cannot be decided quite as accurately, but we are safe in saying that it was within a very few days of January 1, 1817, and probably before that date. I have seen no original copy of its cover, but there is no doubt that it bore the date 1816. De Candolle (Syst. **2**: 703. 1821), doubtless writing with the first four parts before him in their original covers, says: "ELLIOT (Steph.). A Sketch of the Botany of South-Carolina and Georgia. In-8. Charlestown Fasc. I, II, 1816, III, IV, 1817." Gray, in the note quoted at the beginning of this paper, says "before January, 1817," and I believe he is correct. Alterations suggested in Baldwin's letter of Nov. 11 were made use of in the correction of No. 1, the reissue of which occurred with No. 2, so they could not easily have appeared before December. Baldwin, writing to Darlington during the first half of February, 1817 (Reliq. Baldw. 202), says that he has not yet received them, "although noticed in Charleston several weeks ago;" showing that they must have appeared as early as January, 1817; and it seems altogether probable that they were published in the latter part of December, 1816. At all events, they were almost certainly dated 1816, and in such cases the burden of proof always rests with those who would claim that the date as printed is incorrect.

It may be as well here as anywhere to speak of the pagination of the different parts, for here Gray was far astray in his guesses. In his first note he proves (to his own satisfaction) that No. 4 included p. 466; while his second note shows clearly that No. 5 began with p. 401; but he calls no attention to the discrepancy, nor does he offer any new suggestions. As a matter of fact, each number consisted of as nearly one hundred pages as was possible without breaking a signature. Each signature consisted of eight pages, so that one hundred pages would make twelve and a half signatures. To avoid this, the first part consisted of twelve signatures (96 pages), the second of thirteen (104 pages), the third of twelve, and so on, to the last of volume one. The evidence I have to offer upon this point is incontrovertible. We have seen

already that the first part ended with p. 96. Barton (Comp. Fl. Phila., 82), cites p. 197, and as he cites no later pages, it is evident that he had at the time only the first two parts. At the meeting of the Lyceum of Natural History of New York, May 19, 1817 (Am. Mo. Mag. **1**: 127. Je. 1817), Dr. Mitchill "offered the sketch of the botany of South-Carolina and Georgia, by Stephen Elliot, Esq., as far as the same was published. Great satisfaction was expressed on finding this elaborate and classical work had proceeded almost as far as the second order of the fifth class," *i. e.*, almost as far as page 314, which shows that Dr. Mitchill presented Nos. 1–3 at this time. In June, 1818, Rafinesque (Am. Mo. Mag. **3**: 96) reviews the Sketch, "5 Numbers, 8vo., each of 100 pages."

If any further evidence were needed, I have in my possession a copy of pp. 1–400, bound from the original parts. The original covers, except the first, are missing, but the demarcation of the parts is easily discernible.

The third number was doubtless published in March, 1817. Gray says, "on or before April 3, 1817," and I have mentioned the fact that a copy was presented to the New York Lyceum on May 19.

The fourth number was nearly ready for distribution before the end of August. Baldwin (Reliq. Baldw. 242), says that Elliott corrected the last proof-sheet August 21, but owing to an epidemic in Charleston (Reliq. Baldw. 193) it does not seem to have been actually published before October. Baldwin's copy of it reached Wilmington (*i. e.*, Wilmington, *Del.*) November 12 (Reliq. Baldw. 248).

Of No. 5 I have a copy in the original cover and can verify Gray's statement that it bears the date 1817. It probably appeared in December of that year. Baldwin sailed from Hampton Roads for South America on December 3 (Reliq. Baldw. 251, 253), and it is quite certain that he had not seen No. 5 at that time. His letters make no reference to that number, as far as I can discover, and I have no further data to offer.

After the appearance of Number 5, a considerable break occurs in the publication of Elliott's Sketch. As I am not aware that any explanation of this break has ever been given in print, the

following extract from a letter of Stephen Elliott to John Torrey, dated at Charleston, November 21, 1818, may be of interest in this connection:

"Early in January last I was attacked by a Rheumatic affection of the Head so severe that for months I was incapable of attending to anything. I could not even sign my name without suffering. With the return of summer my indisposition abated. But excepting a fortnight in July when I prepared for the press the sixth number of my sketch, my letters to you in January were the last literary exertions I have made. In the commencement of August when I was expecting and preparing to resume my usual habits, circumstances occurred which determined me to visit our Western Country and I have just returned from an excursion over a part of the Alabama Territory. I made this expedition so unexpectedly to myself that I had only time to arrange such business as was absolutely necessary and I have returned merely to visit my Family and business for a moment. In two days I expect to leave this for Columbia to attend the Sessions of our Legislature, and from thence it is uncertain whether I may not return immediately to the Alabama. I have not had time since my return to visit my herbarium and Books which are on a small farm I own about two miles from the City." And again, in a letter without date, but postmarked at Charleston "Aug. 19" and bearing an endorsement by Torrey showing that it was received August 30, 1819: "At present I have not my Herbarium nor my Books in Charleston with me. Thay are at a small farm in the country." These two letters are the only ones from Elliott now to be found among Torrey's correspondence. The others, if they could be found, might throw additional light upon the dates of the Sketch.

The sixth part, concluding the first volume, was not published until 1821. Meanwhile Baldwin had died, September 1, 1819, at Franklin, Missouri Territory, so his correspondence is no longer available for data. Gray says, "before October 12," and I can add nothing to this, although I would not be surprised to learn that it occurred early in the year.

To sum up all the evidence brought out in the preceding discussion, we may say:

No. 1. Pp. 1–96, pl. 1–2, originally issued September 26, 1816; recalled, reprinted and reissued with No. 2. This number (at least when reissued) contained an "Advertisement" of two pages (pp. i–ii) and a Glossary of 14 pages, both usually missing from bound copies of the work.

No. 2. Pp. 97–200, almost unquestionably appeared in December, 1816.

No. 3. Pp. 201–296, March, 1817.

No. 4. Pp. 297–400, October, 1817. Plates 3 and 4, which illustrate species described in No. 1, seem to have been distributed with No. 4—also supplementary pages iii–vi, containing the "advertisement," nearly all of which is quoted above after Gray's notes, and descriptions of several species of *Panicum* and *Agrostis*. These supplementary pages are usually found at the end of Volume I. of bound copies of this work, but appeared with No. 4.

No. 5. Pp. 401–496, 1817, probably December.

No. 6. Pp. 497–606, 1821, probably early in the year.

All that has been said thus far relates to the dates of the first volume. Until recently I was under the impression that the second volume was not issued in parts, but appeared as a whole in 1824. It is true that Gray says, "No. 6, the commencement of the second volume, appeared on or before October 12, 1821," but we have seen that No. 6 was *not* the commencement of the second volume. However, a few months ago I secured copies of the first and second numbers of Volume II. in their original covers.

No. 1. Pp. 1–104, is dated 1821.

No. 2. Pp. 105–208 is dated 1822.

This time, it will be noticed, the numbers did not consist of twelve and thirteen signatures alternately, but of thirteen signatures, or 104 pages, each. From a careful inspection of several bound copies of this volume it seems likely that this size was continued through the remaining parts. Plates 7–12, although almost entirely devoted to plants described in the first volume, were not issued with any of the parts of that volume, nor with parts 1 and 2 of the second volume. When plates 5 and 6 were published I cannot say.

On the back cover of Vol. II., No. 1, is the statement: "This work will be comprised in twelve numbers, to be published monthly

until the work is completed." It is plain that this promise was not kept, but in view of this announcement it is not likely that many months elapsed between the appearance of Nos. 1 and 2. As one is dated 1821 and the other 1822, it is altogether probable that No. 1 was published late in 1821, and No. 2 early in the following year. Of the remaining numbers I have no data at hand, but I think we shall not be far out of the way if we assign 1822 to No. 3, 1823 to Nos. 4 and 5, and 1824, the title-page date, to No. 6. Perhaps some one who reads these lines may possess original copies of these numbers, and can furnish their pagination and dates. It happens that the exact dates of these numbers are not quite so important as those of the others, for during these years 1822–1824 there was a remarkable hiatus in the publication of works relating to American botany, and I know of no question of priority involving the dates of these parts.

We may sum up Volume 2 as follows:

No. 1. Pp. 1–104, 1821, probably late in the year.

No. 2. Pp. 105–208, 1822, probably early in the year.

No. 3. Pp. 209–312, 1822?.

No. 4. Pp. 313–416, 1823?.

No. 5. Pp. 417–520, 1823?.

No. 6. Pp. 521–743, pl. 7–12?, 1824.

Botanisches Centralblatt

The Botanisches Centralblatt which has become the property of the Association Internationale de Botanistes will, beginning with the first of January, 1902, be sent gratis to all members of the Association. The annual fee for members is twenty-five shillings. The number of representatives on the general committee of the Association to which any country is entitled depends on the number of members living in that country. The names of previous subscribers to the Centralblatt are of course known to the editors in cases where the subscriptions were taken in the subscribers' own names but, where copies were ordered through booksellers or other agents, the subscribers' names or even the countries in which they reside are not known. In order, therefore, that the editors may be enabled to know the exact number of members residing in this country and thus ascertain the number of representatives on the committee to which we are proportionally entitled, all desiring to join the Association who have not already registered as members should send their names at once to the Secretary, Dr. J. P. Lotsy, care of E. J. Brill, Leyden, Holland. Any person may join the Association and institutions, such as colleges, libraries, etc., are eligible to membership and can by joining the Association receive the Centralblatt on the same terms as private individuals. The subscription price of the Centralblatt to non-members of the Association is twenty-eight shillings.

A corrected Name

Mentzelia speciosa

Mentzelia aurea Osterhout, Bull. Torr. Club, **28**: 544.

Not *Mentzelia aurea* Nutt. Gen. **1**: 300 which is now a synonym of *Mentzelia oligosperma* Nutt.

GEORGE E. OSTERHOUT.

Proceedings of the Club

WEDNESDAY EVENING, 30 OCT., 1901

Meeting at the College of Pharmacy at 8 p. m., Rev. L. H. Lighthipe in the chair, 19 persons present.

Three new members were elected: F. S. Earle, Botanical Garden, Bronx Park, N. Y.; Alexander P. Anderson, Columbia University, N. Y.; Miss Caroline Coventry Haynes, 16 East 36th street.

The scientific program was opened by a paper by Dr. D. T. MacDougal, entitled "Some Characters of alpine Vegetation." The paper was illustrated with numerous sheets of mountain plants from Montana, many of them attached photographs showing the habitat. In the Missoula region where Dr. MacDougal was working this summer, the growing season for many plants was about 40 days only, but the actual light reaching the plants may have been 30 to 40 per cent. greater than at sea level, and with a larger proportion of blue rays. These mountain tops may be among the dryest places on the continent or may contain swamp pockets. There is no distinct type of alpine vegetation as such; but alpine plants are really xerophytes, being such plants as have adapted themselves to an insufficient water-supply.

Our alpine plants are often thought to be identical with polar plants. But the polar plant receives light continuously through a long period, though the light is of little intensity. The polar plant has an atmosphere of much greater humidity but a much colder soil. Polar plants develop much greater thickness of leaf. Alpine plants abound in more numerous protective devices, as waxy coatings, hair, thicker stems, and modes of propagation without seeds. *Poa alpina*, for example, in many mountain regions is never known to flower.

Remarks followed regarding the viviparous form of *Poa alpina*, Dr. Rydberg observing its abundance in Greenland and Spitzbergen, and Miss Isaacs remarking on her collecting it at 7500 ft., the last summer in Switzerland.

Dr. Underwood called attention to the relative amount of sunlight in tropical and in northern regions, pointing out that the amount of light is much greater north of the tropics though more oblique.

Discussion followed regarding relations of moisture. Dr. Schoeney referred to the peculiar erect and densely appressed stems assumed by a cespitose *Opuntia* about Boulder, Colorado.

Dr. MacDougal spoke of the remarkable degree to which many of the cacti have adapted themselves to xerophytic conditions, so that they lose water less than one-three hundredth as readily as in ordinary plant structures in similar positions.

Dr. Rydberg referred to the permanent moisture found within 10 or 12 inches of the surface in the dry sandhills of Nebraska.

The second paper was by Dr. P. A. Rydberg, "Revision of *Limnorchis* and *Piperia*," which was printed in full in the November BULLETIN.

Reference was made by Mr. G. H. Watson to a remarkable growth near Ellenville, New York, where two trees not only different in species but in family had so twisted together as to become incorporated, and in response to the expressed appreciation of its significance, he promised further investigation and a photograph of the trees.

EDWARD S. BURGESS,
Secretary.

Index to recent Literature relating to American Botany

Arechavaleta, J. Flora Uruguaya. An. Mus. Nac. Montevideo, **2**:—(i–xxi, 1–96). 1898; **3**:—(97–200). 1898; —(201–240). 1900; —(241–304). 1900; —(305–416). 1901; —(417–492). 1901.
This completes volume 1 (i–xxi, 1–492). Includes new species in various genera.

Arthur, J. C. Generic Nomenclature of Cedar Apples. Proc. Ind. Acad. Sci. 1900: 131–136. 1901.

Ashe, W. W. Some East American Species of *Crataegus*. Jour. Elisha Mitchell Sci. Soc. **17**[2]: 6–20. 1901.
15 species and one variety proposed as new.

Atkinson, G. F. Studies of some Shade Tree and Timber Destroying Fungi. Bull. Cornell Agric. Exp. Sta. 193: 199–235. Je. 1901.
Discusses injuries caused by *Polyporus borealis*, *P. sulphureus*, *P. ignarius*, *P. pinicola* and *Trametes abietis*.

Ball, C. R. The Genus *Salix* in Iowa. Proc. Iowa Acad. Sci. **7**: 141–154. *pl. 10–12*. 1900.

Boergesen, F., & Paulsen, O. La Végétation des Antilles Danoises. Rev. Gén. Bot. **12**: 99–107; 138–153; 224–245; 289–297; 344–354; 434–446; 480–510. *f. 1–171* + *pl. 4–14*. 1900. [Also as separate, 1–108.]
Translated and adapted from the original Danish published in Botanisk Tidsskrift, **22**: 1–13. 1898.

Britton, E. G. Spring Foliage in October. Torreya, **1**: 119. 26 O. 1901.

Britton, N. L. *Cupania* on Pine Key, Florida. Torreya, **1**: 132. 25 N. 1901.

Cador, L. Anatomische Untersuchung der Mateblätter unter Berücksichtigung ihres Gehaltes an Thein. [Inaug. Dissert.] 1–39. Cassel, 1900.

Carleton, M. A. Emmer; a Grain for the semiarid Regions. U. S. Dept. Agric., Farmer's Bull. 139: 1–15. *f. 1–3*. 1901.

Chesnut, V. K. Some poisonous Plants of the Northern Stock Ranges. Yearbook U. S. Dept. Agric. 1900: 305–324. *pl. 32–34* + *f. 39–42*. 1901.

Church, A. H. On the Relation of Phyllotaxis to mechanical Laws. Part 1. Construction by orthogonal Trajectories. 8vo. 1–78. *pl. 1–9* + *f. 1–34*. Oxford. S. 1901.

Claassen, E. On the qualitative Determination of the organic Acids in the Fruit of *Rhus glabra* L. and of *Rhus Canadensis* Marsh. Pharm. Review, **19**: 345–350. Au. 1901.

Clark, J. A. Reference List of Publications relating to edible and poisonous Mushrooms. U. S. Dept. Agric. Library Bull. 20: 1–16. 1898.

Copeland, E. B. Cryptogamic and physiological Botany at Cold Spring Harbor in 1901. Torreya, **1**: 127–130. 25 N. 1901.

Copeland, E. B. Meissner on Evergreen Needles. Bot. Gaz. **32**: 356–359. 25 N. 1901. [Illust.]

Coulter, S. Additions to the Flora of Indiana. Proc. Ind. Acad. Sci. 1900: 136–143. 1901.

Coulter, S. Some midsummer Plants of southeastern Tennessee. Proc. Ind. Acad. Sci. 1900: 143–147. 1901.

Davenport, C. B. The Fauna and Flora about Coldspring Harbor, L. I. Science, II. **8**: 685–689. 18 N. 1898.

Davenport, G. E. Miscellaneous Notes on New England Ferns.—II. Rhodora, **3**: 266–270. N. 1901.

Davis, B. M. The Origin of Sex in Plants. Pop. Sci. Monthly, **60**: 66–75. *f. 1–3*. N. 1901.

Deane, W. Albino Fruit of Vacciniums in New England. Rhodora, **3**: 263–266. N. 1901.

V. Pennsylvanicum, forma *leucocarpum*, *V. corymbosum*, var. *atrococcum*, forma *leucococcum*, and *V. Canadense* forma *chiococcum*, described as new.

Deane, W. The Knubble—Advice to Beginners in Botany. Plant World, **4**: 188–191. *pl. 16*. O. 1901.

Duggar, B. M. Studies in the Development of the Pollen Grain in *Symplocarpus foetidus* and *Peltandra undulata*. Bot. Gaz. **29**: 81–98. *pl. 1, 2*. 20 F. 1900.

Dunzinger, G. Beiträge zur Kenntniss der Morphologie und Anatomie der Genera *Hemionitis*, *Gymnogramme* und *Jamesonia*. [Inaug. Dissert.] 1–47. *pl. 1–3*. München, 1901.

Durand, E. J. *Dacryopsis Ellisiana* Massee. Bull. Torr. Club, **28**: 646. 25 N. 1901.

Dusén, P. Zur Kenntniss der Gefässpflanzen des südlichen Patagoniens. Öfvers. Kongl. Vet.-Akad. Förhandl. 1901: 229–264. 1901. [Illust.]

Includes descriptions of *Oxalis loricata* Dusén and *Potamogeton linguatus* Hagstr. sp. nov.

Elliesen, M. Einfluss des Vegetationszustandes verschiedener Hefen auf ihr Vermehrungs- und Gärvermögen. [Inaug. Dissert.] 1–19. Jena, 1901.

Fernald, M. L. The Instability of the Rochester Nomenclature. Bot. Gaz. **32**: 359–367. 25 N. 1901.

Fernald, M. L. The true *Lycopodium complanatum* and its common American Representative. Rhodora, **3**: 278–281. N. 1901.

L. complanatum flabelliforme, var. nov., includes most of the American material.

Fitzpatrick, F. J. & M. F. L. *Veratrum Woodii* in Iowa. Plant World, **4**: 192, 193. 1901.

Fowler, J. A Visit to St. Andrew's, N. B., with a Catalogue of Plants collected in its Vicinity. Proc. Nat. Hist. Assoc. Miramichi, **2**: 21–28. 1901.

Frye, T. C. Development of the Pollen in some Asclepiadaceae. Bot. Gaz. **32**: 325–331. *pl. 13*. 25 N. 1901.

Garman, H. Diseases of Nursery Stock. Bull. Ky. Agric. Exp. Sta. 93: 104–108. 1901. [Illust.]

Discusses crown gall and a knot disease of apple trees.

Garman, H. Enemies of Cucumbers and related Plants. Ky. Agric. Exp. Sta. Bull. 91: 50–56. 1901.

Gattinger, A. The Flora of Tennessee and a Philosophy of Botany. 12mo. 1–296. *Portrait.* Nashville, 1901.

A list of 2,208 species with localities and local distribution.

Gilbert, B. D. Notes on *Lycopodium tristachyum* (*L. chamaecyparissus* A. Br.). Torreya, **1**: 117–119. 26 O. 1901.

Gould, C. N. Additional Notes on the Habitat of the Mesquite in Oklahoma. Plant World, **4**: 193, 194. O. 1901.

Greene, E. L. New Species of *Monardella*. Pittonia, **4**: 321, 322. 7 N. 1901.

M. Modocensis, *M. glauca* and *M. nervosa*, new species.

Greene, E. L. Plantae Bakerianae 3: i–viii, 1–36. 18 N. 1901.

New species in *Ranunculus, Cyrtorhyncha, Delphinium* (2), *Aconitum, Draba* (4), *Arabis* (2), *Thelypodium* (2), *Viola* (6), *Polygonum* (2), *Rumex, Eriogonum* (3), *Apocynum* (2), *Mertensia* (6), *Oreocarya* (2), *Monardella, Castilleia, Pentstemon* (2), *Senecio* (4), *Arnica* (3), *Helianthus, Tetraneuris, Psilostrophe, Hymenopappus* (2), *Artemisia, Erigeron, Plantago, Abronia, Allionia, Thermopsis* (3), and *Lupinus* (5).

Greenman, J. M. Monographie der nord- und centralamerikanischen Arten der Gattung *Senecio.* I. Theil. Allgemeines und Morphologie. [Inaug. Dissert.] 1–37. Leipzig, 1901.

Griffin, H. H. Diseases of Cantaloupes. Bull. Colo. Agric. Exp. Sta. 62: 7. Ap. 1901.

Describes a blight caused by *Macrosporium cucumerium* Ell. & Ev. new species.

Griffiths, D. The Australian Saltbush in Arizona. Bull. Ariz. Agric. Exp. Sta. 38: 291–293. 1901.

Hall, W. L. Forest Extension in the Middle West. Yearbook U. S. Dept. Agric. 1900: 145–156. *pl. 12–15.* 1901.

Güssow, F. Beiträge zur vergleichenden Anatomie der Araliaceae. [Inaug. Dissert.] 1–67. *pl. 1.* Breslau, 1900.

Halsted, B. D. Bean Diseases and their Remedies. Bull. N. J. Agric. Exp. Sta. 151: 1–28. 1 Je. 1901.

Halsted, B. D. Report of the Botanist. Rep. N. J. Agric. Exp. Sta. 2: 407–476.

Diseases of various garden plants; crosses among cucumbers, lima beans, tomatoes, corn; a hybrid salsify.

Harper, R. M. Some popular Plant-names used in Georgia. Torreya, 1: 115–117. 26 O. 1901.

Harrison, F. C. The weeds of Ontario. 8vo. 1–80. *f. 1–34.* Toronto, Mr. 1900.

Havard, V. Notes on Trees of Cuba. Plant World, 4: 163–166. *pl. 11, 12.* S. 1901; 181–185. *pl. 15.* O. 1901.

Henderson, L. F. Biennial Report, Department of Botany. Bull. Idaho Agric. Exper. Sta. 29: 8, 9. 1901.

Henderson, L. F. Mushrooms or Toadstools, A natural Food Product. Bull. Mont. Agric. Exper. Sta. 27: 27–64. 1901.

Hess, A. W., & Vandivert, H. Basidiomycetae of Central Iowa. Proc. Iowa Acad. Sci. 7: 183–187. *pl. 16.* 1900.

Halsted, B. D. Weeping Tomatoes. Torreya, **1**: 130, 131. 25 N. 1901.

Hill, E. J. *Cerastium arvense oblongifolium.* Bot. Gaz. **29**: 141, 142. 20 F. 1900.

Hollick, A. Notes on Block Island. Ann. N. Y. Acad. Sci. **11**: 55–88. *pl. 2–9.* 1898.
Botanical notes, pp. 63–70.

Holm, T. On some Canadian Species of *Gentiana;* Sectio Crossopetalae Froel. Ottawa Nat. **15**: 175–182. *pl. 11–14.* N. 1901.
G. Macounii, G. procera, G. nesophila, and *G. elegans brevicalycina* new.

Holzinger, J. M. Some interesting Cases of Plant Distribution. Plant World, **4**: 185–187. O. 1901.

Howard, L. O. Smyrna Fig Culture in the United States. Yearbook U. S. Dept. Agric. 1900: 79–106. *pl. 1–8. f. 1–7.* 1901.

Huber, J. Aponamentos sobre o Caucho Amazonico. Boletim do Museu Paraense, **3**: 72–87. F. 1900.

Huber, J. Duas Sapotaceas novas do Horto Botanico Paraense. Boletim do Museu Paraense, **3**: 54–59. *pl. 1–2.* F. 1900.
Chrysophyllum excelsum and *Lucuma macrocarpa.*

Huber, J. Materiaes para a Flora Amazonica. III. Fetos do Amazonas inferior e de algumas Regioes limitrophes, colleccionados pelo Dr. J. Huber e determinados pelo Dr. Hermann Christ, Basilea (Suissa). Boletim do Museu Paraense, **3**: 60–64. F. 1900.
New species and variety in *Trichomanes, Pteris* and *Polypodium.*

Jensen, A. E. Structure of the Stem Bark of *Hamamelis Virginica* L. Pharm. Archives, **4**: 121–123. *pl. 1, 2.* Jl. 1901.

Jones, L. R. Report of the Botanist [for 1900]. Rep. Vt. Agric. Exp. Sta. **13**: 268–332. 1901.
Potato diseases and their remedies; impurities of grass and clover seeds; a soft rot of carrots and other vegetables caused by *Bacillus carotovorus* Jones, sp. nov.

Kellerman, W. A. Ohio Fungi Exsiccati. (With Reprint of Original Descriptions.) Ohio Naturalist, **2**: 135–140. N. 1901.
16 species enumerated.

Knight, O. W. *Solanum rostratum* in Central Maine. Rhodora, **3**: 276. N. 1901.

Knowlton, F. H. A fossil Nut Pine from Idaho. Torreya, **1**: 113–115. *f. 1–3.* 26 O. 1901.

Krembs, A. G., Jr. The Structure of the Stems of *Myrica Gale* L. and *Myrica cerifera* L. Pharm. Archives, **4**: 128–136. *pl. 3, 4.* Jl. 1901.

MacDougal, D. T. Duplication of Contributions on Physiology of Tendrils. Torreya, **1**: 125–127. 25 N. 1901. [Illust.]

MacDougal, D. T. Sensory Mechanism of Plants. Pop. Sci. Monthly, **60**: 174–176. *f. 1–6.* D. 1901.

Malguth, R. Biologische Eigentümlichkeiten der Früchte epiphytischer Orchideen. [Inaug. Dissert.] 1–58. Breslau, 1901.

Meehan, T. *Hamamelis Virginiana.* Meehan's Monthly, **11**: 145, 146. *pl. 10.* O. 1901.

Meehan, T. *Prinos verticillatus.* Meehan's Monthly, **11**: 161, 162. *pl. 11.* N. 1901.

Meehan, T. *Vitis incisa.* Meehan's Monthly, **11**: 113, 114. Au. 1901.

Merrell, W. D. A Contribution to the Life History of *Silphium.* Bot. Gaz. **29**: 99–133. *pl. 3–10.* 20 F. 1900.

Mohr, C. Notes on the Red Cedar. Bull. U. S. Dept. Agric. (Div. Forestry), 31: 1–37. *pl. 1–3 + f. 1–13.* N. 1901.

Moore, G. T. New or little-known unicellular Algae. II.—*Eremosphaera viridis* and *Excentrosphaera.* Bot. Gaz. **32**: 309–324. *pl. 10–12.* 25 N. 1901.

Murdoch, J., Jr. A new Station for *Lactuca Morssii.* Rhodora, **3**: 278. N. 1901.

Murrill, W. A. The generative Divisions in Gymnosperms. Torreya, **1**: 131, 132. 25 N. 1901.

Nelson, A. A new Violet. Bot. Gaz. **29**: 143. 20 F. 1900.
Viola erectifolia A. Nelson.

Nelson, A. The Brome-Grasses of Wyoming. Bull. Wyo. Exp. Sta. 46: 1–21. *pl. 1–3 + f. 1–9.* Ja. 1901.

Osterhout, G. E. New Plants from Colorado. Bull. Torr. Club, **28**: 644, 645. 25 N. 1901.
New species in *Linum, Mentzelia, Artemisia* and *Agoseris, cf.* correction, l. c., 630.

Pammel, L. H. Powdery Mildew of the Apple. Proc. Iowa Acad. Sci. **7**: 177–182. *pl. 33–35.* 1900.

Pammel, L. H. The weedy Plants of Iowa. Proc. Soc. Prom. Agric. Sci. **21**:—(1–5). 1900.

Parish, S. B. A Group of Western American Solanums. Proc. Cal. Acad. Sci. (Botany) III. **2**: 159–172. 23 O. 1901.

Nine species and varieties enumerated, five of them new.

Pieters, A. J. The Plants of Western Lake Erie with Observations on their Distribution. Bull. U. S. Fish Comm. 1901: 57–79. *pl. 11–20.* 1901.

Price, O. W. Practical Forestry in the Southern Appalachians. Year-Book U. S. Dept. Agric. 1900: 357–368. *pl. 38–43.* 1901.

Ramirez, J. El *Pileus heptaphyllus.*—Nuevo género de las Papayáceas. An. Inst. Med. Nacional, **5**: 24–29. *pl. 1–4.* 1901.

Rendle, A. B. Notes on *Trillium.* Jour. Bot. **39**: 321–335. *pl. 426, A, B.* 1 O. 1901.

Includes descriptions of *T. Rugelii* sp. nov. from North Carolina and *T. affine* sp. nov. from Georgia, and critical notes on various other American species.

Robertson, C. Flower visits of oligotropic Bees. Bot. Gaz. **32**: 367, 368. 25 N. 1901.

Robinson, B. L. Problems and Possibilities of Systematic Botany. Science, II. **14**: 465–474. 27 S. 1901.

Address of the retiring President of the Botanical Society of America, 28 Au. 1901. Reprinted as Publication 15 of the Society.

Robinson, B. L. The North American Euphrasias. Rhodora, **3**: 270–276. N. 1901.

E. Williamsii, E. Randii, E. Randii Farlowi, and *E. Americana Canadensis,* new species, variety and combination.

Rusby, H. H. More concerning Truxillo Coca Leaves. Druggists Circ. and Chem. Gaz. 1901. ? Mr. 1901. [Illust.]

Rydberg, P. A. The American Species of *Limnorchis* and *Piperia,* north of Mexico. Bull. Torr. Club, **28**: 605–643. *f. 1–34.* 25 N. 1901.

Enumerates 32 species, with 22 new species, varieties and combinations.

Salmon, E. G. Bryological Notes (15). *Philocrya* Hagen & Jensen. Jour. Bot. **39**: 339–341. 1 O. 1901.

Transfers *Oligotrichum Lescurii* (James) Mitten to *Lyellia* and makes *Philocrya* a synonym of the latter.

Schaffner, J. H. The maximum Height of Plants, III. Ohio Naturalist, **2**: 142. N. 1901.

Schrenck, H. von. Fungous Diseases of Forest Trees. Yearbook U. S. Dept. Agric. 1900: 199–210. *pl. 21–25.* 1901.

Schulze, H. Beiträge zur vergleichenden Anatomie der Gattungen *Lupinus* und *Argyrolobium*. [Inaug. Dissert.] 1–44. Cöthen, 1901.

Scovell, J. T. The Flora of Lake Maxinkuckee. Proc. Ind. Acad. Sci. 1900: 124–131. 1901.

Scribner, F. L. Our native Pasture Plants. Yearbook U. S. Dept. Agric. 1900: 581–598. *pl. 76–79 + f. 75–85.* 1901.

Seckt, H. Beträge zur mechanischen Theorie der Blattstellungen bei Zellenpflanzen. [Inaug. Dissert.] 1–27. *pl. 1, 2.* Cassel, 1901.

Shull, G. H. Some Plant Abnormalities. Bot. Gaz. **32**: 343–355. *f. 1–36.* 25 N. 1901.

Smith, E. A. Biographical Sketch of Dr. Charles Mohr. Bull. Torr. Club, **28**: 599–604. 25 N. 1901. [Portrait.]

Smith, F. G. On the Distribution of Red Color in the Vegetative Parts in the New England Flora. Bot. Gaz. **32**: 332–342. 25 N. 1901.

Smith, J. G. Commercial Plant Introduction. Yearbook U. S. Dept. Agric. 1900: 131–144. 1901.

Sodiro, L. Anturios Ecuatorianos. 1–17. Quito, 1901. [Illust.]
A key to 174 species of *Anthurium* from Ecuador.

Stuart, W. A bacterial Disease of Tomatoes. Proc. Ind. Acad. Sci. 1900: 153–157. 1901.

Stuart, W. A Study of the Constituents of Corn Smut. Proc. Ind. Acad. Sci. 1900: 148–152. 1901.

Suck, W. Die geographische Verbreitung des Zuckerrohrs. [Inaug. Dissert.] 1–75. Halle, 1900.

Swingle, W. T. The Date Palm and its Culture. Yearbook U. S. Dept. Agric. 1900: 453–490. *pl. 54–62. f. 57–63.* 1901.

Thomas, M. B. Cryptogamic Collections made during the Year. Proc. Ind. Acad. Sci. 1900: 121–123. 1901.

Thomas, M. B. Experiments with Smut. Proc. Ind. Acad. Sci. 1900: 123, 124. 1901.

Tracy, S. M., & Earle, F. S. Fungi. Pl. Bakerianae, **1**: 15–37. 22 F. 1901.

New species in *Guepinia* (2), *Boletus*, *Naucoria*, *Lachnum*, *Charonectria*, *Zignoella*, *Gibberidia* (2), *Otthia* (2), *Amphisphaeria* (2), *Strickeria*, *Trematosphaeria*, *Lophiostoma*, *Platystomum* (4), *Mycosphaerella* (2), *Ophiobolus* (2), *Pleospora* (2), *Monilia*, *Exosporium*, and *Phoma*.

Trelease, W. The Progress made in Botany during the Nineteenth Century. Trans. Acad. Sci. St. Louis, **11**: 125–142. 26 N. 1901.

Tyler, F. J. Geophilous Plants of Ohio, II. Ohio Naturalist, **2**: 132, 133. *f. 1.* N. 1901.

Waugh, F. A. What is *Prunus insititia?* Bot. Gaz. **29**: 144. 20 F. 1900.

Wildeman, É. de. *Alnus occidentalis* Dippel. Ic. Select. Hort. Thenensis, **2**: 147. *pl. 75.* Au. 1901.

Includes a key to the North American species of *Alnus* and a synonymy of the species.

Wildeman, É. de. *Azara microphylla* Hook. f. Ic. Select. Hort. Thenensis, **2**: 129. *pl. 71.* Au. 1901.

A species from the Andes of Chili.

Wildeman, É. de. Les Caféiers. 8vo. 1–43. Bruxelles, 1901.

Wildeman, É. de. *Oreopanax permixtum* El. Marchal. Ic. Select. Hort. Thenensis, **2**: 133. *pl. 72.* Au. 1901.

A Brazilian species.

Williamson, E. B. A few mycological Notes for July and August, 1900, Wells and Whitley Counties. Proc. Ind. Acad. Sci. 1900: 161–165. 1901.

Williams, E. F. Tree Willows at Fort Kent, Maine. Rhodora, **3**: 277, 278. N. 1901.

Salix lucida macrophylla Anderss. recorded for the first time in the United States.

GENERIC INDEX

ABIES, 665.
Abutilon, 336, 339, 343, 346.
Acalypha, 95, 302–305, 336, 338, 341, 346.
Acanthospermum, 99, 454.
Acer, 355.
Acerates, 680.
Acetabulum, 321, 334, 364.
Acicularia, 321, 334, 364.
Acrista, 527, 547, 555–558, 568, 569.
Acrocomia, 527, 559, 561–563, 565–567.
Actinospermum, 99, 480, 484.
Acuan, 93.
Adiantum, 46.
Adoxa, 283.
Aecidium, 664.
Aeria, 540, 547–549, 555, 561.
Aeschynomene, 94, 483.
Aesculus, 359.
Agave, 187.
Agoseris, 511, 645.
Agrimonia, 102–108, 295–300, 514–518.
Agropyron, 240.
Ailanthus, 337.
Aiphanes, 561, 563.
Alchornea, 305–308.
Allium, 487.
Alnus, 528.
Alsine, 274.
Alternanthera, 92.
Amaranthus, 92.
Ambrosia, 77, 83.
Amelanchier, 665.
Amorpha, 94, 471.
Ampelopsis, 80, 95.
Anagallis, 97.
Anantherix, 680.
Andropogon, 82, 85, 236, 237, 463.
Anemia, 2, 372.
Anogra, 664.
Antennaria, 21, 41, 252, 482.
Anthemis, 484.
Aplectrum, 387.
Aplopappus, 372.
Arabis, 39, 372.
Arceuthobium, 388.
Ardesia, 185.
Areca, 528, 547, 549, 551.
Arenaria, 275.
Argemone, 93.
Arisaema, 247–250, 363, 469.
Aristida, 82, 85, 236, 464.
Aristolochia, 470.
Arnica, 20.
Artemisia, 20, 42, 645.
Arum, 247.
Asarum, 471.
Ascyrum, 82, 96.
Asclepias, 97, 229, 485.
Aster, 22, 99, 111, 192, 372, 504, 647.
Astragalus, 36, 40, 372.
Atriplex, 77, 92.
Attalea, 528.
Avena, 372, 678.
Avicennia, 78, 83, 98.
Azalea, 360.
Azolla, 84.

BACCHARIS, 80, 82, 99.
Bactris, 527, 550, 559, 560, 562–564.
Baldwinia, 74, 99, 483.
Baptisia, 82, 94.
Battarrea, 422, 437.
Batis, 68, 77, 79, 83, 92, 101, 470.
Berchemia, 474.
Betula, 412.
Bidens, 99, 664.
Blephariglottis, 605.
Blitum, 273.
Boehmeria, 312, 372.
Boltonia, 99, 664.
Borrichia, 77, 82, 99.
Botrychium, 109, 111.
Bouteloua, 236.
Bradburya, 94.
Brauneria, 251.
Brayodendron, 357.
Breweria, 74, 97.
Bromus, 241–246, 372.
Bulgaria, 349, 354.
Burmannia, 468, 470.

CAKILE, 69, 77, 93.
Calamagrostis, 372.
Callithamnion, 257, 263.
Calochortus, 372.
Calyptocalyx, 556.
Campanula, 25.
Camptosorus, 461.
Canavalia, 69, 70, 79, 83, 85, 94.
Cardamine, 280.
Carduus, 448, 507, 508–510.
Carex, 111, 266, 372.
Carlina, 447.
Caryota, 527.
Castalia, 93.
Castilleja, 25, 26, 231, 502.
Catis, 557.
Catoblastus, 551.

Cebatha, 93.
Cecropia, 309.
Celtis, 308.
Cenchrus, 69, 72, 74, 75, 82, 85, 464.
Centella, 83, 96.
Cephalozia, 1.
Ceramium, 257.
Ceramothamnion, 257–265.
Ceranthera, 480.
Ceratochloa, 242, 243.
Cercospora, 84, 187.
Chamaecrista, 73, 94.
Chamaecyparis, 1.
Chamaedorea, 563.
Chamaedrys, 167.
Chamaerops, 530.
Chaetochloa, 72, 86.
Chenopodium, 77, 92, 675–677.
Chlamydopus, 422, 436.
Chloris, 84, 236.
Chlorophora, 308.
Chlorosplenium, 350, 354.
Chrysanthemum, 448.
Chrysobalanus, 480.
Chrysoma, 77, 83, 100, 445–450.
Chrysopogon, 463.
Chrysopsis, 100, 232, 233.
Chrysothamnus, 503.
Cicuta, 477.
Circaea, 252.
Cirsium, 508, 509.
Citrullus, 79, 99.
Citrus, 343.
Cladonia, 73.
Cladium, 89.
Clarkia, 678.
Claviceps, 238, 240.
Claytonia, 487.
Cleidion, 307.
Clematis, 372.
Clinopodium, 98, 478.
Clitoria, 72, 94.
Cnicus, 507, 508.
Coccothrinax, 544.
Cocops, 555, 567–569.
Cocos, 527, 558, 563, 567–569.
Codium, 257, 263.
Coeloglossum, 605, 622.
Collinsonia, 683.
Collybia, 285.
Commelina, 72, 90.
Conceveiba, 306.
Conocarpus, 186.
Conradina, 480.
Convolvulus, 97, 187.
Copernicia, 529.
Corallorrhiza, 270.
Coreopsis, 483.
Cornus, 337.
Coryne, 351, 354.
Corypha, 530–532.
Cotoneaster, 675.
Crataegus, 372, 604.
Crepis, 42, 512.
Croton, 73, 82, 95, 301, 473.
Crotalaria, 94.
Cryptanthe, 31.
Cucumis, 676, 677.
Curima, 559, 561–565.
Cuscuta, 77, 97, 98, 501.
Cycas, 528.
Cynoctonum, 187.
Cyperus, 68, 72, 89, 372, 465.

DACRYOPSIS, 351, 354, 519, 646.
Dalechampia, 307.
Dasystoma, 451.
Delphinium, 276, 471, 667–674.
Dendrium, 360.
Dendromyces, 438.
Desmatodon, 372.
Diamorpha, 681.
Dicerandra, 479, 480.
Dichromena, 89, 683, 684.
Dictyocephalus, 441.
Diodia, 72, 79, 99.
Diospyros, 356.
Distichlis, 77, 82, 86.
Diplachne, 84.
Dodocatheon, 43, 227.
Dolicholus, 472.
Dondia, 69, 77, 92.
Draba, 278.
Drosera, 1, 82, 93.

ECLIPTA, 82, 100.
Ectocarpus, 257.
Elaeis, 558.
Eleocharis, 90, 467.
Elliottia, 648.
Elymus, 77, 86, 237, 239.
Epicampes, 662.
Epilobium, 648.
Equisetum, 461.
Eragrostis, 69, 86.
Erechtites, 100.
Erianthus, 86, 683.
Erigeron, 23, 24, 41, 100, 372.
Eriocaulon, 483.
Eriogonum, 111, 372, 480.
Eryngium, 477, 483.
Erysimum, 277.
Erythronium, 132.
Eschscholtzia, 678.
Eupatorium, 363, 372.
Euphorbia, 68, 72, 75, 76, 82, 84, 95, 301, 480.
Euterpe, 550, 551, 556, 557, 563.
Exobasidium, 287.

FESTUCA, 243.
Ficus, 308.

Fimbristylis, 90.
Fragaria, 372.
Froelichia, 92.
Fuirena, 46.
Funaria, 6.

GALACTIA, 94.
Galium, 99.
Gaussia, 547, 548.
Geranium, 34.
Gerardia, 73, 82, 99, 372, 451.
Geum, 372.
Gilia, 29, 43.
Glottidium, 472.
Glyceria, 663.
Gnaphalium, 100, 252.
Gonolobus, 485.
Goniotrichum, 257.
Graphium, 349, 354.
Gratiola, 79, 99, 462.
Gymnadenia, 605, 633, 635, 639.
Gymnadeniopsis, 606.
Gymnolomia, 372.
Gymnosporangium, 665.

HABENARIA, 269, 270, 272, 605 608, 610–612, 614, 616–641.
Helenium, 100.
Helianthemum, 82, 96.
Helianthus, 676, 677.
Helietta, 291.
Heliopsis, 661.
Heliotropium, 98.
Hemicarpha, 90.
Hepatica, 471.
Herminium, 633, 635.
Herniaria, 289.
Heteranthera, 469.
Heterocladium, 123–131.
Heterotheca, 100.
Hevea, 301.
Hexalectris, 470.
Hibiscus, 96.
Hieracium, 111, 512.
Hilaria, 236, 237, 241.
Holwaya, 349–355.
Hordeum, 678.
Houstonia, 99, 480.
Howea, 556.
Hulsea, 111.
Hydnum, 199–222.
Hydrangea, 471.
Hydrocotyle, 68, 72, 97.
Hypericum, 82, 96, 291, 359, 475.
Hypnum, 124, 125.
Hysterostomella, 185.

ILEX, 68, 74, 82, 95, 186.
Impatiens, 34.
Indigofera, 94.
Inodes, 529–534, 545.
Ipomoea, 69, 71, 77, 83, 84, 97.
Isnardia, 462.
Isoetes, 462.
Iva, 68, 72, 75, 77, 82, 83, 100.

JATROPHA, 74, 95, 301.
Juglans, 313.
Juncus, 1, 68, 79, 91, 469.
Juniperus, 84, 475, 665.
Jussiaea, 96.

KOSTELETZKYA, 82, 96.
Kyllingia, 90, 465.

LACINARIA, 82, 372, 481.
Lacistema, 313.
Lactuca, 484.
Lahmia, 354.
Lantana, 98.
Lappula, 30, 31, 44.
Lathyrus, 37.
Lecanidion, 350, 354.
Lechea, 82, 96.
Leitneria, 474.
Lejeunea, 81.
Lembosia, 185.
Lemna, 84, 90.
Lepidium, 77, 83, 93, 678.
Leptilon, 77, 83, 100.
Leucobryum, 73.
Leucothoë, 290.
Ligusticum, 223.
Lilium, 132.
Limnorchis, 269, 605–643, 691
Limonium, 79, 97, 478.
Linaria, 678.
Linum, 95, 644, 676, 677.
Lippia, 79, 83, 98.
Liriodendron, 493, 498.
Lithophila, 79, 83.
Lomatium, 226.
Lonicera, 486.
Lophozia, 1.
Loranthus, 376.
Ludwigia, 96.
Lupinus, 111, 135, 675–677.
Lycium, 68, 77, 98.
Lycoperdon, 424.
Lycopodium, 412, 461.
Lycopus, 98, 462.
Lygodium, 2, 364.
Lysiella, 606.
Lysimachia, 133, 478.

MABEA, 307.
Machaeranthera, 233, 506.
Magnolia, 187, 355, 495, 498.
Manihot, 302.
Marara, 561, 563–565.
Marchantia, 446.
Martinezia, 527, 551, 560–565.

Mauritia, 527.
Melia, 95.
Melica, 372.
Melilotus, 94.
Meliola, 184.
Mentha, 98.
Mentzelia, 644, 689.
Mertensia, 32, 33.
Mesademia, 483.
Mesosphaerum, 483.
Mimosa, 93, 675–677.
Mimulus, 27, 45.
Mitchella, 99.
Mnium, 5.
Mollugo, 72, 92.
Monarda, 82, 98, 502.
Monniera, 99.
Montolivaea, 269, 270, 635, 638, 640.
Muhlenbergia, 19, 72.
Musineon, 225.
Myrica, 68, 74, 91.

NASTURTIUM, 648.
Nemophila, 137–160, 678.
Nymphaea, 648.

ODONTOSCHISMA, 1.
Oenothera, 96.
Oldenlandia, 79, 99.
Omphalia, 307.
Onobrychis, 675–677.
Opuntia, 74, 77, 82, 83, 86, 96, 476, 691.
Orchis, 605, 607, 608, 617–620, 622.
Oreodoxa, 527, 549–551, 554, 569.
Oreolirion, 571.
Ornithopteris, 2.
Orthocarpus, 111.
Orthotrichum, 372.
Osmunda, 84.
Oxalis, 94.
Oxypolis, 483.

PANICULARIA, 663.
Panicum, 67, 68, 70–72, 83, 86, 87, 372, 462, 463, 663.
Pappophorum, 236.
Paronychia, 288.
Paspalum, 84.
Passalora, 187.
Patellaria, 350, 354.
Pedicularis, 27.
Pelargonium, 339.
Pellia, 73.
Pentstemon, 28, 111, 230, 503.
Pera, 308.
Peridermium, 665.
Persea, 93, 184.
Perularia, 605, 622.
Peucedanum, 226.
Phacelia, 30, 44, 111, 229.
Pharmacosycea, 309.
Phaseolus, 473.
Phenax, 313.
Philadelphus, 471.
Phlox, 111.
Phoenix, 528.
Phoradendron, 374, 388.
Phragmites, 80, 88.
Phyllanthus, 301.
Physaria, 278, 279.
Physalis, 72, 98.
Picradenia, 21.
Pilea, 311.
Piloxerus, 83.
Pinanga, 556.
Pinus, 68, 73, 82, 84, 405, 455, 458, 462, 675–677.
Piperia. 269, 270, 605–643, 691.
Plantago, 112–122.
Platanthera, 269, 270, 605–643.
Platanus, 493.
Plowrightia, 187.
Pluchea, 83, 100.
Poa, 266, 690.
Podocarpus, 528.
Podostigma, 680.
Pogonatum, 5.
Polemonium, 29.
Polygala, 82, 95, 473.
Polygonella, 91.
Polygonum, 77, 84, 91, 92, 111.
Polymnia, 482.
Polypodium, 74.
Polypremum, 79, 97.
Pontederia, 90.
Ponthieva, 470.
Populus, 91, 374.
Porteranthus, 372.
Porterella, 372.
Portulaca, 678.
Potentilla, 173–183, 223.
Pouzolzia, 313.
Primula, 500.
Proserpinaca, 96.
Prunus, 290, 372.
Pseudo-cymopterus, 224.
Ptelea, 291–294.
Pteridium, 486.
Pterigynandrum, 130.
Pteris, 84, 486.
Pterogonium, 124.
Ptilota, 263.
Puccinia, 84, 661–664.

QUERCUS, 68, 73, 82, 91, 188, 355, 357, 374, 422, 441.

RAMALINA, 73, 75.
Ranunculus, 372.
Raillardella, 111.
Rhamnus, 308.
Rhexia, 82, 465, 476.
Rhizoclonium, 1.

Rhodochorton, 257, 263.
Rhus, 82, 95.
Rhynchosia, 94.
Rhynchospora, 90, 468.
Riccia, 133, 161–165, 252.
Ricinus, 675–677.
Roestelia, 665, 666.
Robinia, 374, 472.
Roystonea, 547, 549–556, 561.
Rudbeckia, 234, 251.
Rubus, 79, 93.
Rumex, 92.
Ruppia, 67, 82, 85.

SABAL, 68, 73, 83, 90, 185, 460, 529–534.
Sabbatia, 82, 97, 478.
Sagittaria, 85, 462.
Salicornia, 68, 77, 79, 83, 92.
Salix, 80, 91, 271, 337, 499.
Salsola, 69, 92.
Sambucus, 99, 503.
Samolus, 97.
Sanicula, 477.
Sapium, 307.
Saprolegnia, 261.
Sarracenia, 454, 458, 468, 483.
Sarothra, 96.
Saxifraga, 283.
Schizaea, 1–19, 364.
Scirpus, 72, 90, 466.
Scleranthus, 93.
Scleria, 90.
Secale, 676, 677.
Sedum, 282.
Selaginella, 412, 461.
Senecio, 362, 372.
Serenoa, 68, 72, 75, 82, 83, 90, 459.
Sesban, 94.
Sesuvium, 69, 72, 83, 93.
Seutera, 77, 83, 97.
Sida, 96.
Sieglingia, 82
Siphonychia, 75, 79, 93, 480.
Sisyrinchium, 570–592.
Sitanion, 110, 239.
Smilacina, 664.
Smilax, 82, 91, 480.
Solanum, 98.
Solidago, 40, 83, 100, 372, 445, 450, 480.
Sonchus, 100.
Sophia, 48, 281.
Sorbus, 666.
Sorghum, 463.
Sorocea, 309.
Spartina, 70, 77–80, 83, 88.
Sphaericeps, 422.
Sphagnum, 1.
Spinifex, 71.
Spiranthes, 270, 633, 635.
Spixia, 308.
Sporobolus, 77, 88, 266, 464.
Stachys, 488.
Steironema, 477.
Stenophyllus, 90, 467, 480.
Stenotaphrum, 88.
Stilbum, 351, 354, 519.
Stillingia, 474.
Stipulicida, 93.
Streptocarpus, 487.
Streptopus, 267.
Strophostyles, 68–70, 76, 82, 94.
Stylandra, 680.
Stylosanthes, 94.
Swertia, 227.
Syagrus, 567, 569.
Syntherisma, 72, 88.
Syringa, 339.

TAMARISCINA, 92.
Taraxacum, 512.
Taxodium, 84, 458.
Taxus, 337, 338, 341, 344, 347.
Teucrium, 98, 166, 172.
Thlaspi, 280.
Thrinax, 529, 530, 534–539, 540–544, 546, 554.
Thrincoma, 529, 534, 536, 539–546.
Thringis, 529, 544–546.
Thuidium, 123.
Tilia, 349, 355.
Tillandsia, 74.
Tilmia, 565.
Townsendia, 22.
Toxylon, 91.
Tragia, 307.
Trema, 308.
Tremella, 285–287.
Trichomanes, 6, 8, 11.
Trifolium, 37, 39, 94, 372, 499.
Trichostema, 480.
Triglochin, 82, 85.
Trilisa, 100.
Trillium, 469.
Triodea, 236.
Triplasis, 82, 88.
Trisetum, 111.
Triticum, 676–678.
Turnera, 96.
Tylostoma, 421–443.
Typha, 84.

UNIOLA, 70, 75, 83, 89, 461
Urera, 309.
Uromyces, 84.
Urostigma, 308.
Urtica, 309.
Utricularia, 1, 79, 99.

VACCINIUM, 97.
Vagnera, 268, 664.

Valeriana, 24, 232.
Verbena, 98, 478.
Vernonia, 481.
Viburnum, 337, 339, 483.
Vicia, 500.
Vigna, 72, 77, 80, 94.
Vilfa, 266.
Vincetoxicum, 83, 485.
Viola, 372, 475.
Viscum, 375, 386.
Vitis, 82, 95.
Vittaria, 364.

WILLUGHBAEA, 82, 100.
Woodwardia, 483.

XANTHIUM, 100.
Xanthoxylum, 82, 95, 473.
Xylorrhiza, 662.
Xyris, 79, 683.

YEATESIA, 480.
Yucca, 71, 83, 91, 461.

ZEA, 676, 677.

GENERAL LIBRARY,
UNIV. OF MICH.
JAN 3 1902

VOL. 28 DECEMBER, 1901 No. 12

BULLETIN

OF THE

TORREY BOTANICAL CLUB

EDITOR

LUCIEN MARCUS UNDERWOOD

ASSOCIATE EDITORS

NATHANIEL LORD BRITTON FRANCIS ERNEST LLOYD
CARLTON CLARENCE CURTIS DANIEL TREMBLY MACDOUGAL
MARSHALL AVERY HOWE HERBERT MAULE RICHARDS
ANNA MURRAY VAIL

CONTENTS

New Species of Uredineae—I: *J. C. Arthur* 661
Notes on Californian Species of *Delphinium*: *Alice Eastwood* 667
Germination of the Seeds of some common cultivated Plants after prolonged Immersion in Liquid Air: *A. D. Selby* 675
Dates of Elliott's Sketch: *John Hendley Barnhart* 680
Botanisches Centralblatt 689
A corrected Name: *George S. Osterhout* . 689
Proceedings of the Club 690
INDEX TO RECENT LITERATURE RELATING TO AMERICAN BOTANY 692
Generic Index 701

PUBLISHED FOR THE CLUB

THE NEW ERA PRINTING COMPANY
LANCASTER, PA.

THE TORREY BOTANICAL CLUB

President,

HON. ADDISON BROWN.

Vice-Presidents,

T. F. ALLEN, M.D. HENRY H. RUSBY, M.D.

Recording Secretary,

EDWARD S. BURGESS, PH.D.,

Normal College, New York City.

Corresponding Secretary,

JOHN K. SMALL, PH.D.,

Botanical Garden, Bronx Park, New York City.

Treasurer,

H. B. FERGUSON, M.D.,

College of Pharmacy, New York City.

Meetings the second Tuesday and last Wednesday of each month alternately at the College of Pharmacy and the New York Botanical Garden.

PUBLICATIONS. Bulletin. Monthly, established 1870. Price $3.00 per year; single numbers 30 cents. Of former volumes only 1–6, and 19–27 can be supplied entire. Partial numbers only of vols. 7–18 are available, but the completion of sets will be undertaken. All correspondence to be directed to the Editor at Columbia University, New York City.

Torreya. Monthly, established 1901. Price $1 00 per year. Address the editor, Dr. Marshall A. Howe, New York Botanical Garden, Bronx Park, New York City.

Memoirs. (See last page of cover.)

ESTABLISHED 1851.

EIMER & AMEND,

MANUFACTURERS AND IMPORTERS OF

Chemicals and Chemical Apparatus.

205, 207, 209 & 211 Third Ave.,

Corner of 18th Street, NEW YORK.

SOLE AGENTS FOR THE UNITED STATES OF NORTH AMERICA, FOR

E. March's Sæline Chemical Stone Ware.

Schleicher & Schuell's Chemically Pure and Common Filter Paper.

Doctor C. Scheibler's Saccharometers (Polariscopes).

Prof. Jolly's Specific Gravity Balances, etc.

Le Brun F. Desmontes & Co., of Paris, Platinum.

H. Tronesdorff's C. P. Chemicals.

SPECIALTIES:—Bacterioscopical Apparatus, Normal Graduated Glassware, Porcelain from the Royal Berlin and Meissen Factories, Bohemian and German Glassware, Filter Papers, Agate Mortars, Pure Hammered Platina, Balances and Weights, Copperware, Bunsen's Burners and Combustion Furnaces, Apparatus and Chemicals for Sugar Chemists.

LABORATORY OUTFITS

FOR

FERTILIZERS, ASSAYERS, UNIVERSITIES AND COLLEGE

GLASS-BLOWING, ETCHING, GRINDING AND REPAIRING.

MEMOIRS OF THE TORREY BOTANICAL CLUB

A series of technical papers on botanical subjects. Established 1889. Price, $3 00 per volume. Separate numbers supplied at following prices which are strictly net. The Memoirs are not offered in exchange.

Volume 1, No. 1.—Studies of the Types of various Species of the genus *Carex*. By L. H. Bailey. Price, $1.00.

No. 2.—A List of the Marine Algæ hitherto observed on the Coasts of New Jersey and Staten Island. By Isaac C. Martindale. Price, 50 cents.

No. 3.—An Enumeration of the Hepaticæ collected by Dr. H. H. Rusby in South America, with descriptions of many new species. By Richard Spruce. Price, 75 cents.

No. 4.—On Seedless Fruits. By E. Lewis Sturtevant. Price, 75 cents.

Vol. 2. No. 1.—On reserve Food Materials in Buds and surrounding Parts, with two plates. By Byron D. Halsted. (Only sold with full volumes.)

No. 2.—Contributions to the Botany of Virginia, with two plates. By Anna Murray Vail and Arthur Hollick. Price, 75 cents.

No. 4.—A Monograph of the North American Species of the Genus *Polygala*. By William E. Wheelock. Price, 75 cents.

Vol. 3. No. 1.—On the Flora of Western North Carolina and contiguous Territory. By John K. Small and A. A. Heller. (Only with full volumes.)

No. 2.—A Revision of the North American Naiadaceæ with illustrations of all the species. By Thomas Morong. Price, $2.00.

No. 3.—An Enumeration of the Plants collected in Bolivia by Miguel Bang. By Henry H. Rusby. Price, 50 cents.

Vol. 4. No. 1.—Index Hepaticarum. Part 1, Bibliography. By Lucien M. Underwood. Price, 75 cents.

No 2.—Report on the Botanical Exploration of Virginia during the Season of 1892. By John K. Small and Anna Murray Vail. Price, 50 cents.

No. 3.—An Enumeration of the Plants collected in Bolivia by Miguel Bang—II. By Henry H. Rusby. Price, 50 cents.

No. 4.—*Arachis hypogæa* L., with three plates. By Anna Stockton Pettit. Price, 50 cents.

No. 5.—Monograph of *Physalis* and related Genera. By P. A. Rydberg. Price, 75 cents.

Vol. 5. List of Pteridophyta and Spermatophyta growing without cultivation in Northeastern North America. Prepared by the Botanical Club, A. A. A. S. Price, $3.00.

Vol. 6. No. 1.—An Enumeration of the Plants collected in Bolivia by Miguel Bang—III. By Henry H. Rusby. Price, $1.25.

No. 2.—A Revision of the North American Isotheciaceæ and Brachythecia. By Abel Joel Grout. Price, 50 cents.

No. 3.—The Life History of *Sphaerella lacustris* (*Hæmatococcus pluvialis*). With two colored plates. By Tracy Elliot Hazen. Price, 50 cents.

No. 4.—A Review of the Genera of Ferns proposed prior to 1832. By Lucien M. Underwood. Price, 50 cents.

No. 5.—Notes on the Lichen Distribution in the Upper Mississippi Valley. By Bruce Fink. Price, 25 cents.

Vol. 7. The Hepaticæ and Anthocerotes of California. With thirty five plates. By Marshall Avery Howe. Price, $3.00.

Vol. 8. No. 1, Part 1.—The Comparative Embryology of the Rubiaceæ. With six plates. By Francis Ernest Lloyd. Price, 50 cents.

Vol. 9. Monograph of the Erysiphaceæ. By E. S. Salmon, F. L. S. Price, $3.00.

The Club has also published the following local catalogue:

Preliminary Catalogue of Anthophyta and Pteridophyta reported growing within one hundred miles of New York, 1888. Price, $1.00.

Address: **L. M. UNDERWOOD,**

COLUMBIA UNIVERSITY, NEW YORK CITY.